

VI. *Contributions to the Natural History of the Anthropoid Apes.* No. VIII. *On the External Characters of the Gorilla* (*Troglodytes Gorilla, Sav.*). By Professor OWEN, F.R.S., F.Z.S., &c.

Read January 11th, 1859.

[PLATES XLIII.—XLIX.]

AFTER ten years' correspondence, appeals, and instructions, carried on with a view to obtaining from the Gaboon the desired materials for completing our knowledge of the external characters of the Gorilla, I am enabled to submit to the Society so much of the desired information as can be had from the study of a young but nearly full-grown male specimen (Pls. XLV. & XLVI.), which reached the British Museum, preserved in spirits, on the 10th of September, 1858.

Before, however, proceeding to the description of this specimen, I may be permitted briefly to recapitulate the steps which have led to the determination of the great anthropoid Ape of Africa, called *Troglodytes Gorilla*, of which but vague and uncertain indications had previously reached the scientific world.

The first authentic information which I received of its existence was by a letter from Dr. Savage, dated 'Gaboon River, West Africa,' April 24, 1847, enclosing a sketch of the cranium, and requesting that the results of my comparison might be communicated to him, which was done.

In December 1847 I received from Bristol two skulls of the full-grown male, and one of a female, descriptions of which, with the previous evidence which had reached me, were communicated to the Zoological Society, February 22, 1848<sup>1</sup>.

The skulls obtained by Dr. Savage at the Gaboon were taken by him to Boston, U. S., and were described by the Doctor and Prof. Wyman in the 'Journal of the Natural History Society of Boston' (vol. v. 1847), and the name *Troglodytes Gorilla* was proposed for the species.

Translations of Dr. Wyman's and my papers being published in the 'Annales des Sciences Naturelles,' the attention of Continental naturalists was strongly excited toward this unexpected addition to the Mammalian class; and the inducements held out for the collection of specimens have led to the acquisition of additional materials for completing the zoographical history of the animal which it seems now agreed to call "Gorilla." Those which reached London previous to the present date enabled me to communicate to the Zoological Society<sup>2</sup> a description of the entire skeleton of the *Troglodytes Gorilla*, since published, with illustrations, in the 'Transactions' of the Society<sup>3</sup>, the main facts being previously recorded in my 'Descriptive Catalogue of the 'Osteological Collection in the Museum of the Royal College of Surgeons,' 4to, 1853,

<sup>1</sup> Trans. Zool. Soc. vol. iii. p. 381, pls. 58-63.

<sup>2</sup> Proc. Zool. Soc. Nov. 11, 1851.

<sup>3</sup> Vol. iv. pt. iii. p. 75. pls. 26-30, pt. iv. p. 89. pls. 31-36, and vol. v. pt. i. p. 1. pls. 1 to 13.

pp. 782-804. Entire skeletons of the full-grown *Troglodytes Gorilla* are now set up in the Museum of the College and in the British Museum.

All the foregoing specimens were obtained from a part of the west coast of tropical Africa traversed by the rivers "Fernandes Vas," "Danger," and "Gaboon," in latitudes 1° to 10° N. and 1° to 15° S.

A corresponding series of illustrations—first crania, then the skeleton, finally an entire specimen of the *Troglodytes Gorilla*—have successively reached the Museum of the Garden of Plants, Paris, and have afforded materials for interesting and instructive memoirs from the accomplished Professors in that noble establishment for extending and diffusing the science of natural history.

Prof. de Blainville had caused a lithograph to be prepared of the skeleton of the Gorilla, shortly before his demise. His successor, Prof. Duvernoy, communicated a description of this skeleton to the Academy of Sciences in 1853, which is published, with some interesting particulars of the anatomy of the soft parts, in the 'Archives du Muséum d'Histoire Naturelle,' tome vii. (1855). The Memoirs and Observations by the accomplished Professor of Mammalogy and Ornithology, Isidore Geoffroy St.-Hilaire, on the Gorilla will be found in the 'Comptes Rendus de l'Académie des Sciences,' January 19, 1852, and subsequent numbers; in the 'Revue de Zoologie,' No. ii. 1853; the whole being summed up in the part of his excellent 'Description des Mammifères nouveaux,' &c., 4to, which appeared in vol. x. of the 'Archives du Muséum,' 1858.

The differences in the results of the observations by the American, French, and English authors relate chiefly to the interpretation of the facts observed. Dr. Wyman agrees with me in referring the Gorilla to the same genus as the Chimpanzee, but he differs in regarding the latter as being more nearly allied to the Human kind. Professors I. Geoffroy St.-Hilaire and Duvernoy consider the differences in the osteology, dentition, and external characters of the Gorilla to be of generic importance<sup>1</sup>, and enter it in the Zoological Catalogue as *Gorilla Gina*, the *nomen triviale* being taken from 'Weggeena,' 'Ngina' and 'Djina,' as the name of the beast in the Gaboon tongue has been diversely written by voyagers. The French naturalists also concur with the American in placing the Gorilla below the Chimpanzee in the scale. I propose to discuss these questions at the conclusion of the present paper, and to test the notion current in some works that the long-armed Apes (*Hylobates*), and not the Orangs or Chimpanzees, are the most anthropoid of Quadrumana.

The young male Gorilla, here described, was killed by natives in the interior of the Gaboon, and brought down to the port entire: it was at once immersed in a cask of

<sup>1</sup> The main discrepancy, in regard to matter of fact, is that the arms of the Gorilla are stated by Isid. Geoffroy to be much longer, whilst I found them to be relatively shorter, than those of the Chimpanzee.

"Bras { de proportions presque humaines . . . . . Genre I. Troglodytes.  
beaucoup plus longs que chez l'homme . . . . . Genre II. Gorilla." (Isid. Geoff. p. 15.)

Compare, however, plate 48. vol. i. Trans. Zool. Soc. (*Troglodytes niger*) with plate 13. vol. v. ib. (*Troglodytes Gorilla*).

spirits; but as no antiseptic had been applied to the skin when fresh, decomposition had made some advance; and when the cask was opened on its arrival in London, a great part of the cuticle with the hair had become detached from the specimen. It had, however, come off in large patches; and, as the texture had acquired a certain hardness through the action of the alcohol, their replacement was practicable, and the characteristic shades of colour of the different parts of the body and limbs could be determined.

Before availing ourselves of this condition of the cuticle for taxidermal purposes, I proceeded to secure the features, proportions, and position of the body and limbs, as presented to view on removing the animal from the preserving liquor, by means of photography, and four of the views so taken are given in Plate XLV.

As the parts which were stripped of their natural covering were in a condition to afford an instructive comparison with the naked body of Man, I was glad to receive the aid of the graphic skill of Mr. Joseph Wolf in securing the characteristic outline-views given in Plate XLVI.

The length and strength of the upper limbs, the large proportional size of the head, hands, and feet to the trunk, and the shortness and thickness of the neck first attract attention. Owing to the backward articulation of the skull and the great length of the spines of the neck-vertebræ<sup>1</sup>, the contour from the occiput to the back is in almost a straight line (Pl. XLV. fig. 4), and the cervical construction is shown only at the sides and fore part of the neck. Here the prominence of the muzzle is such that, although the chin recedes, it descends, in the ordinary *pose* of the head, before and below the manubrium sterni; and owing to the great size of the blade-bones, with the oblique course taken by the clavicles to reach the acromion processes, these, with the shoulder-joints, rise to above the level of the angles of the lower jaw.

From the strong superorbital ridge the forehead recedes at first with a slight concavity, and then passes with a gentle convexity to the vertex. As the sagittal crest rises to give due attachment to the growing crotaphyte muscles in the older male, the contour from the superorbital ridge to the upper part of the occiput becomes almost a straight line. The superorbital prominence is a marked feature in the skeleton, which is exaggerated in the living animal by a thick superciliary roll of integument, which, with the thick epiderm and the hair continued thereon, forms a scowling pent-house over the small, deep-set eyes (Pl. XLIII.).

The nose is indicated by a slight median longitudinal convexity extending from the interorbital space and subsiding to midway towards the mouth, when it is again more prominently marked by broad cartilaginous alæ, arching from a slight median prominence, each over its own nostril, and increasing in thickness outward and downward, and then inward to the upper lip (Pl. XLV. figs. 2 & 3). There is a slight median furrow on the upper part of the alar or cartilaginous portion of the nose: a deeper indent divides the nasal ala from the cheek, becoming shallower as it bends upward, inward, and

<sup>1</sup> Zool. Trans. vol. iv. pl. 33. fig. 1, vol. v. pl. 13. fig. 2.

downward to the median furrow. The aspect of the nostrils is forward and a little outward. The cartilaginous 'septum narium' extends to the tip of the interalar prominence, its margin being slightly concave: the median point of confluence of the alæ projects a little beyond the fore part of the 'septum.' Thus the nose is more prominent than in the Chimpanzee and Orang-utan, and offers a nearer resemblance to that feature in the West-African negro.

The upper eyelid is largest and most moveable, and its eyelashes are longer than those of the lower lid. The wrinkles exterior to the eyelids were strongly marked in this young animal. The interspace between the inner canthi is longer than the extent of the opening of the eyelids (Pl. XLV. fig. 3).

The mouth is of great width; the lips large, of uniform thickness, the upper one terminating in a straight, almost as if incised, margin. The upper lip is, however, relatively shorter than in the Chimpanzee, and this is an important comparative character with Man; it is coincident with the shorter premaxillaries pointed out in a former memoir<sup>1</sup>. The dark pigment is continued from the base of the lip to this margin, and no part of the thin and smooth inner lining would be visible when the lips were naturally closed: a little of this lining, which forms what is commonly understood by "lip" in Man, might be shown by the under lip of the Gorilla, but it is obscured by added pigment, as in most Negro races. The chin is short and receding; but the whole face is prominent. The circumference of a front view of the head (Pl. XLV. fig. 3) presents an oval, with the great end downward: in the old male the upper end is very narrow, owing to the development of the parietal ridge. The superorbital or cranial part is confined to the upper fifth in this view, and the bestial aspect of the visage is much increased when the huge prominent tusks are exposed in the full-grown male by opening the lips (Pl. XLIII.). In a direct front view the ears are rather above the level of the eyes; they are as much smaller in proportion to the head, as in the Chimpanzee they are larger, in comparison with Man; but in structure they resemble the human auricle more than does the ear of any other Ape.

The tragus and anti-tragus, the helix and anti-helix, the concha, the fossa of the anti-helix and the lobulus are distinctly defined: the chief difference is the large size of the concha compared with the fossa of the anti-helix and the lobulus; but though the lobulus is small, it is distinctly marked and pendulous, while it is sessile in the Chimpanzee and Orang. Both tragus and anti-tragus are nearly as prominent as in Man. The helix is reflected or folded centrally from its origin to opposite the anti-tragus, as in Man, whereas in the Chimpanzee the fold subsides opposite the fossa of the anti-helix, and the rest of the margin of the auricle is simple, not folded. The upper part of the helix is more produced in the Gorilla than in Man, and the greatest

<sup>1</sup> Zool. Trans. vol. iii. p. 392:—"The extent of the premaxillary bones below the nostril is not only relatively but absolutely less in *T. Gorilla*; and the profile of the skull is less concave at this part, or less 'prognathic,' than in *T. niger*."



breadth of the ear is above the concha, in which the 'incisura intertragica' is less deep than in Man.

The hairy part of the scalp is continued to the superorbital prominence, the hairs becoming gradually shorter to that part; thence the hair-clad skin is continued outward and downward upon the sides of the deep cheeks, where the hair is long: it becomes rapidly shorter upon the upper lip and as it approaches the margin of the lower lip: but there is no excessive development of hair in the positions of the Human whiskers and beard [nor are these more marked in the old male Gorilla]<sup>1</sup>. The naked parts of the skin of the face are much wrinkled, and these are deep where related to the action of the well-developed cutaneous muscles corrugating the eyebrows and moving the eyelids and the *alæ nasi*.

The chest is of great proportional capacity, and the shoulders are very wide across. The profile of the trunk behind describes a slight convexity from the nape, which projects beyond the occiput, downward to the sacrum: the blade-bones slightly project; but there is no inbending at the loins, which seem wanting. The abdomen is prominent both before and at the sides. The pectoral regions are slightly marked, and show the pair of nipples placed as in the Chimpanzee and Man. In the male the penis (Pl. XLVI. fig. 2) is short and subconical; the prepuce is devoid of *frænum*; the scrotum is broader and more sessile than in Man; the perineum is longer, the anus being placed further back than in Man (*ib.*). There is no trace of ischial callosities. The *glutei* are better developed and give more of the appearance of nates (Pl. XLVI. fig. 1) than in any other anthropoid Ape, but they do not project so as to meet beyond the anus and conceal it.

The chief deviations from the Human structure are seen in the limbs, which are of great power, the upper ones prodigiously strong, making by comparison the legs, through the want of "calves," look feeble.

The first characteristic is the almost uniform thickness of each segment of the limb: this is seen in the arm, from below the short deltoid prominence to the condyles, neither biceps nor triceps making any definite swelling: a like uniform thickness is seen in the antibrachium from below the olecranon to the wrist: the leg increases a little in thickness from the knee to the ankle (Pl. XLVI. fig. 1): the short thigh shows some decrease as it descends; but there is a general absence of those partial muscular enlargements which impart the graceful, varying curves to the outlines of the limbs in Man. Yet this, upon dissection, is found to depend rather on excess than defect of development of the *carneous* as compared with the *tendinous* parts of the limb-muscles, which thus continue of almost the same size from their origin to their insertion, with a proportionate gain of strength to the beast.

The difference in the length of the upper limbs between the Gorilla and Man is but

<sup>1</sup> The passages within brackets, relating to the full-grown male Gorilla, have been added to the original paper from observations of the well-preserved skins purchased by the British Museum of Mr. du Chaillu, in 1861.

little in comparison with the trunk ; it appears greater through the arrest of development of the lower limbs. Very significant of the closer anthropoid affinities of the Gorilla is the superior length of the arm (humerus) to the fore-arm, as compared with the proportions of those parts in the Chimpanzee. The hair of the arm inclines downward, that of the fore-arm upward, as in the Chimpanzee. The thumb extends a little beyond the base of the proximal phalanx of the fore-finger ; it does not reach to the end of the metacarpal bone of that finger in the Chimpanzee or any other Ape : the thumb of the Siamang (*Hylobates syndactyla*) is still shorter in proportion to the length of the fingers of the same hand. The philosophical zoologist will appreciate the significance of this fact. In Man the thumb extends to, or beyond, the middle of the first phalanx of the fore-finger.

The fore-arm in the Gorilla passes into the hand with very slight evidence, by constriction, of the wrist (Pl. XLVI. fig. 3), the circumference of which, without the hair, was fourteen inches, that of a strong Man averaging eight inches. The hand (Pl. XLVII. figs. 2 & 3) is remarkable for its breadth and thickness, and for the length of the palm, occasioned both by that of the metacarpus and by the greater extent of undivided integument between the digits than in Man ; these only begin to be free opposite the middle of the proximal or first phalanges, and nearer the second phalanx between the third and fourth fingers. The digits are thus short, and appear as if swollen and gouty, chiefly through the callous pads of cuticle on the back of the middle and distal phalanges (*ib.* fig. 3): they are also more or less conical in shape after the first joint, by tapering to nails, which, being not larger or longer than those of Man, are relatively to the fingers much smaller. The circumference of the middle digit at the first joint in the Gorilla is  $5\frac{1}{2}$  inches ; in Man, at the same part, it averages  $2\frac{3}{4}$  inches. The thick and callous skin on the back of the fingers leaves little outward appearance of the second joint. The habit of the animal to apply those parts to the ground, in occasional progression (Pl. XLIV. fig. 1), is manifested by these callosities. The back of the hand (Pl. XLVII. fig. 3) is hairy as far as the divisions of the fingers ; the palm (*ib.* fig. 2) is naked and callous. The thumb, besides its shortness according to the standard of the human hand, is scarcely half so thick as the fore-finger. The nail of the thumb did not extend to the end of that digit ; in the fingers the nail projected a little beyond the end, but with a slightly convex worn margin, resembling the human nails in shape, but relatively less.

In the hind limbs was chiefly noticeable that first appearance in the Quadrumanous series of a muscular development of the gluteus, causing a small buttock to project over each tuber ischii (Pl. XLVII. fig. 1). This structure, with the peculiar expanse, as compared with other Quadrumana, of the iliac bones<sup>1</sup>, leads to an inference that the

<sup>1</sup> The intrepid and much-enduring explorer and observer of living nature at the Gaboon, to whom science is indebted for the best and most abundant materials for enlarging our knowledge of the anthropoid Apes, remarks : —“ The common walk of the Gorilla is not on his hind legs, but on all-fours.” When advancing as a biped to

Gorilla must naturally and with more ease resort occasionally to station and progression on the lower limbs than any other Ape<sup>1</sup>.

The same cause as in the arm, viz. a continuance of a large proportion of fleshy fibres to the lower end of the muscles, coextensive with the thigh, gives a great circumference to that segment of the limb above the knee-joint, and a more uniform size to it than in Man. The relative shortness of the thigh, its bone being only eight-ninths the length of the humerus (in Man the humerus averages five-sixths the length of the femur<sup>2</sup>), adds to the appearance of its superior relative thickness. Absolutely the thigh is not of greater circumference at its middle than is the same part in Man.

The chief difference in the leg, after its relative shortness, is the absence of a "calf," due to the non-existence of the partial accumulation of carneous fibres in the upper half of the gastrocnemii muscles, causing that prominence in the type-races of Mankind. In the Gorilla the tendo Achillis not only continues to receive the "penniform" fibres to the heel, but the fleshy parts of the muscles of the foot receive accessions of fibres at the lower third of the leg, to which the greater thickness of that part is due, the proportions in this respect being the reverse of those in Man. The leg expands at once into the foot, which has a peculiar and characteristic form (Pl. XLVII. figs. 4 & 5), owing to the modifications favouring bipedal motion being superinduced upon an essentially prehensile quadrumanous type. The heel makes a more decided backward projection (Pl. XLVI. fig. 1) than in the Chimpanzee; the heel-bone is relatively thicker, deeper, more expanded vertically at its hind end, besides being fully as long, relatively to the size of the animal, as in the Chimpanzee<sup>3</sup>. This bone, so characteristic of anthropoid affinities, is shaped and proportioned more like the Human calcaneum than in any other Ape, but with differences far greater than those which any two genera of *Quadrumania* present in serial comparison. The malleoli do not make such well-marked projections as in Man; they are marked more by the thickness of the fleshy and tendinous parts of the muscles that pass near them, on their way to be inserted into parts of the foot. Although the foot be articulated to the leg with a slight inversion of the sole, it is more nearly plantigrade than in the Chimpanzee or any other Ape. The hairy integument is continued along the dorsum of the foot to the clefts of the toes, and upon the first phalanx of the hallux (Pl. XLVII. fig. 5): the whole sole is bare (ib. fig. 4).

The hallux (great toe, thumb of the foot, Pl. XLVII. figs. 4 & 5 *i*), though not relatively longer than in the Chimpanzee, is stronger; the bones are thicker in proportion to their length, especially the last phalanx, which in shape and breadth more resembles

attack, "his walk is a waddle from side to side, his hind legs, which are very short, being evidently somewhat inadequate to the proper support of the huge superincumbent body. He balances himself by swinging his arms, somewhat as sailors walk on shipboard." "My own observations led me to the conclusion that the Gorilla walks more often in the erect posture than the Chimpanzee; and in this I agree with the conclusion of Prof. Owen." (Du Chaillu, 'Explorations and Adventures in Equatorial Africa.')

<sup>1</sup> Memoir, No. VII. p. 12. pl. 6.

<sup>2</sup> Ib. p. 14: compare pl. 3 with pl. 7.

<sup>3</sup> Ib. p. 22. pl. 11.

that in the Human foot<sup>1</sup>. The hallux in its natural position diverges from the other toes at an angle of 60 degrees from the axis of the foot; its base is large, swelling into a kind of ball below, upon which the thick callous epiderm of the sole is continued. The transverse indents and wrinkles show the frequency and freedom of the flexile movements of the two joints of the hallux (Pl. XLVI. fig. 6): the nail is small, broad, and short. The sole of the foot gradually expands from the heel forward to the divergence of the hallux, and seems to be here cleft, and almost equally, between the base of the hallux and the common base of the other four digits. These are small and slender in proportion, and are enveloped in a common tegumentary sheath as far as the base of the second phalanx. A longitudinal indent at the middle of the sole, bifurcating—one channel defining the ball of the hallux, the other running towards the interspace between the second and third digit—indicates the action of opposing the whole thumb (which seems rather like an inner lobe or division of the sole) to the outer division terminated by the four short toes (ibid.). What is termed the “instep” in Man is very high in the Gorilla, owing to the thickness of the carneo-tendinous parts of the muscles as they pass from the leg to the foot over this region. The mid-toe (Pl. XLVII. figs. 4 & 5 *iii*) is a little longer than the second (ib. *ii*) and fourth (ib. *iv*); the fifth (ib. *v*), as in Man, is proportionally shorter than the fourth, and is divided from it by a somewhat deeper cleft. The whole sole is wider than in Man—relatively to its length much wider, and in that respect, as well as by the offset of the hallux, and the definition of its basal ball, becomes a “hand,” and one of huge dimensions and of portentous power of grasp.

In regard to the outward coloration of the Gorilla, only from the examination of the living animal could the precise shades of colour of the naked parts of the skin be truly described. The parts of the epiderm remaining upon the face of the subject of the present description indicated the skin there to be chiefly of a deep leaden hue; it is everywhere finely wrinkled, and was somewhat less dark at the prominent parts of the supraciliary roll and the prominent margins of the nasal “*alæ*,” the soles and palms were also of a lighter colour.

Although the general colour of the hair appears at first sight, and when moist, to be dark, it is rather of a dusky grey: it is very different from that of the Chimpanzee (*T. niger*), being lighter and more varied in different parts of the animal: this is due to an admixture of a few reddish, and of more greyish, hairs with the particoloured fuscous and grey ones which chiefly constitute the “pelage;” and the above admixture varies at different parts of the body. The reddish hairs are so numerous on the scalp, especially along the upper middle region, as to make their tint rather predominate there; they blend in a less degree with the long hairs upon the sides of the face. The greyish hairs are found mixed with the dusky upon the dorsal, deltoidal, and anterior femoral regions; but, on the limbs, not in such proportion as to affect the impression of the general dark colour, at first view. The hairs are wavy, approach-

<sup>1</sup> See, however, the difference between *Homo* and *Gorilla* in this respect (Memoir, No. VII. pl. 11. *i, i*).



ing to a woolly character. Near the margin of the vent are a few short whitish hairs, as in the Chimpanzee. The epiderm of the back showed the effects of habitual resting with that part against the trunk or branch of a tree, occasioning the hair to be more or less rubbed off: the epiderm was here very thick and tough<sup>1</sup>.

It is most probable, from the degree of admixture of different-coloured hairs above described, that a living Gorilla, seen in bright sunlight, would in some positions reflect from its surface a colour much more different from that of the Chimpanzee than appears by a comparison of the skin of a dead specimen sent home in spirits. It can hardly be doubted, also, that age will make an appreciable difference in the general coloration of the *Troglodytes Gorilla*.

[The adult male Gorilla brought to London by Mr. du Chaillu, and purchased for the British Museum, measures 5 feet 6 inches from the sole to the top of the head: the breadth across the shoulders is nearly 3 feet: the length of the upper limb is 3 feet 6 inches; that of the lower limb, from trochanter to sole, is 2 feet 7 inches, but, carried out to the end of the mid-toe, it is 3 feet 5 inches: the length of the head and trunk is 3 feet 6 inches, whilst the same dimension in Man does not average, indeed seldom reaches, 3 feet.

The skin of this adult male (Pl. XLIII.), and those of the female and of the young (Pl. XLIV. fig. 2) of the *Troglodytes Gorilla*, also brought by Mr. du Chaillu from the Gaboon, afford ample evidence of the true coloration of the species. In the male, the rufo-griseous hair extends over the scalp and nape, terminating in a point upon the back (Pl. XLIV. fig. 1). The prevalent grey colour, produced by alternate fuscous and light-grey tracts of each hair, extends over the back, the hair becoming longer upon the nates and upon the thighs. The dark-fuscous colour gradually prevails as the hair extends down the leg to the ankle. The long hair of the arm and fore-arm presents the dark-fuscous colour; the same tint extends from below the axilla downwards and forwards upon the abdomen, where the darker tint contrasts with the lighter grey upon the back. The scanty hair of the cheeks and chin is dark. The breast is almost naked, and the hair is worn short or partially rubbed off across the back, over the upper border of the iliac bones, in consequence of the habit ascribed by Mr. du Chaillu to the great male Gorilla of keeping at the foot of a tree, resting its back against the trunk. The female Gorilla presents a darker and more rufous tint than the male; but this may be due to difference of age. In one female the rufous colour so prevailed as to induce Mr. du Chaillu to note it as a "red-rumped variety."

In the young male Gorilla, 2 feet 6 inches in height, 1 foot 7 inches in the length of the head and trunk, and 11 inches across the shoulder, the calvarium is covered with a well-defined "skull-cap" of reddish-coloured hair (Pl. XLIV. fig. 3). The back part of the head behind the ears, the temples, and chin are clothed with that mixture

<sup>1</sup> ["I have come upon fresh traces of a Gorilla's bed on several occasions, and could see that the male had seated himself with his back against a tree-trunk." (Du Chaillu, *op. cit.*)]

of fuscous-brown and grey hair which covers with a varying depth of tint the trunk, arms, and thighs. The naked part of the skin of the face appears to have been black, or of a very dark lead-colour; a few scattered straight hairs, mostly black, represent the eyebrows. A narrow moustache borders the upper lip: the whole of the lower lip and sides of the head are covered with hair of the prevailing grey-fuscous colour.

In Pl. XLIV. the male Gorilla (fig. 1) is drawn by Mr. Wolf walking off in the distance, in the attitude suggested by the callosities on the back of the fingers of the fore-hand<sup>1</sup>.]

The foregoing pages include the results of direct observations made on the first and only entire specimen of the Gorilla which has reached England. At the period when they were made, no other description of its external characters had reached me; and if the majority of them be found to agree with previously recorded observations by naturalists enjoying earlier opportunities of studying similarly preserved specimens, the rarity and importance of the species may excuse, if it does not justify, a second description from direct scrutiny of a new specimen by an old observer of the anthropoid *Quadrumana*.

A more important labour, however, remains. The accurate record of facts in natural history is the first duty of the observer; the true deduction of their consequences is his next aim. I proceed, therefore, to reconsider the conclusions in which my experienced French and American fellow-labourers in natural history differ from me, and in which I seem to stand alone.

The first question in regard to the Gorilla is its place in the scale of nature, and its true and precise affinities.

Is it, or is it not, the nearest of kin to Human kind? Does it form, like the Chimpanzee and Orang, a distinct genus in the anthropoid or knuckle-walking group of Apes? Are these Apes, or are the long-armed Gibbons, more nearly related to the genus *Homo*? Of the broad-breast-boned *Quadrumana*, are the knuckle-walkers or the brachiators, *i. e.* the long-armed Gibbons, most nearly and essentially related to the Human subject? I proceed to discuss the first as the most important question.

At the first aspect, whether of the entire animal or of the skeleton, it may be freely admitted that the Gorilla strikes the observer as being a much more bestial and brutish animal than the Chimpanzee. All the features that relate to the wielding of the strong jaws and large canines are exaggerated; the evidence of brain is less—its chamber is more masked by the outgrowth of the strong occipital and other cranial ridges. But the impression so made—that the Gorilla is less like Man—is the same which is derived from comparing a young with an adult Chimpanzee, or some small tailless Monkey with a full-grown male Orang or Chimpanzee. Taking the characters that cause that impression at a first inspection of the Gorilla, most of the small South-American

<sup>1</sup> This inference has been confirmed by Mr. du Chaillu's observations on the living Gorilla and its foot-marks.

Monkeys are more anthropoid than it; they have a proportionally larger and more human-shaped cranium, much less prominent jaws, with more equable teeth.

In the skeletons of the adult males of the Gorilla, Chimpanzee, Orang, and Gibbon, it may be remarked that the globular cranium of the last, and its superior size compared with the jaws and teeth, seem to show the Gibbons to be more nearly akin to Man than are the larger tailless Apes; and this conclusion has been adopted by a distinguished French palæontologist, M. Lartet, and accepted by a geological authority at home<sup>1</sup>. They cite the experienced Professor of Human Anatomy at Amsterdam as supporting this view; but I have failed to find any statement of the grounds upon which it was sustained. In the article "Quadrumanæ" of Todd's 'Cyclopædia of Anatomy,' cited by Lartet<sup>2</sup>, Prof. Vrolik briefly treats of the osteology of the Quadrumanæ according to their natural families. In "a first genus, *Simia* proper, or Ape," he includes the Chimpanzee or Orang, noticing some of the chief points by which these Apes approach the nearest to Man. He next goes to "the second genus, the Gibbons" (*Hylobates*); he notices their ischial callosities, and the nearer approach of their molars, in their rounded form, to the teeth of Carnivora than the molars of the genus *Simia*. Then, comparing the Siamang with other species of *Hylobates*, Vrolik says, "its skeleton approaches most to that of Man"—which may be true in comparison with other Gibbons, but certainly is not so as respects the higher *Simiæ*. No details are given to illustrate the proposition even in its more limited application; but the minor length of the arms in the Siamang, as compared with *Hylobates lar*, was probably the character in point.

The appearance of superior cerebral development in the Siamang and other long-armed Apes is due to their small size and the concomitant feeble development of their jaws and teeth. The same appearance makes the small platyrrhine Monkeys of South America equally anthropoid in their facial physiognomy, and much more human-like than are the great Orangs and Chimpanzees. It is an appearance which depends upon the precocious growth of the brain as dependent on the law of its development. In all Quadrumanæ the brain has reached its full size before the second set of teeth is acquired—almost before the first set is shed. If, however, a young Gorilla, Chimpanzee, or Orang be compared with a young Siamang of corresponding age, the absolutely larger size and better shape of the brain, the deeper and more numerous convolutions of the cerebrum, and the more completely covered cerebellum in the former, unequivocally demonstrate the higher organization of the shorter-armed Apes. "In the structure of the brain," writes Vrolik<sup>3</sup>, in accordance with all other comparative anatomists, "they" (Chimpanzee and Orang-utan) "approach the nearest to Man." The degree to which the Chimpanzee and Orang so resemble the Human type seemed much closer to Cuvier,

<sup>1</sup> Sir C. Lyell, 'Supplement to the Fifth Edition of a Manual of Elementary Geology,' 1859, p. 15.

<sup>2</sup> Comptes Rendus de l'Académie des Sciences, Juillet 28, 1856.

<sup>3</sup> Art. *Quadrumanæ*, 'Cyclopædia of Anatomy,' vol. iv. p. 195.

who knew those great Apes only in their immaturity, with their small milk-teeth and precociously developed brain. Accordingly, the anthropoid characters of the *Simia Satyrus* and *Simia Troglodytes*, as deduced from the facial angle and dentition, are proportionally exaggerated in the 'Règne Animal'<sup>1</sup>. As growth proceeds, the milk-teeth are shed, the jaws expand, the great canines succeed their diminutive representatives, the temporal muscles gain a proportional increase of carneous fibres, their bony fulcra respond to the call for increased surface of attachment, the sagittal and occipital crests begin to rise: but the brain grows no more; its cranial box retains the size it showed in immaturity; it finally becomes masked by the superinduced osseous developments in those Apes which attain the largest stature and wield the most formidably armed jaws. Yet, under this show of physical force, the brain of both Orang and Chimpanzee is still the better and the larger than is that of the little long-armed Ape, which retains throughout life so much more of the characters of immaturity, especially in the structure of the skull.

The Siamang and other Gibbons have smaller but longer upper canines, relatively, than in the Orangs and Chimpanzees; the permanent ones more quickly attain their full size, and are sooner in their place in the jaws; consequently the last molar teeth (*m* 3) come last into place, as they do in the Human species. But, if this be interpreted as of importance in determining the relative affinity of the longer-armed and shorter-armed Apes to Man, it is a character in which, as in their seeming superior cerebral development, the *Hylobates* agree with some much lower Quadrumana with still smaller canines.

The systematic zoologist, pursuing this most interesting comparison with clear knowledge of the true conditions and significance of a globular cranium and small jaws within the Quadrumanous order, first determines, and takes as his compass or guide-point, the really distinctive characters of the Human organization.

In respect to the cerebral test, he looks not so much for the relative size of the brain to the body, as for its relative size in the species compared one with another in the same natural group. He inquires what quadrumanous animal shows absolutely the biggest brain? what species shows the deepest and most numerous and winding convolutions? in which is the cerebrum largest as compared with the cerebellum? If he finds all these characters highest in the Gorilla, he does not permit himself to be diverted from the just inference because the great size and surpassing physical power attained in that species mask the true data from obvious view.

The comparative anatomist would look to the cæcum and the ischial integument: if he found in one subject of his comparisons (*Troglodytes*) a long "appendix vermiformis cæci," as in Man, but no "callosities,"—in another subject (*Hylobates*) the ischial callosities, but only a short rudiment of the cæcal appendix,—he would know which of the two tailless Apes was to be placed next "the Monkeys with ischial callosities and no vermiform appendix," and which of the two formed the closer link toward Man. He would find

<sup>1</sup> Ed. 1829, pp. 87, 89.



that the anthropoid intestinal and dermal characters were associated with the absolutely larger and better-developed brain in the Gorilla, Chimpanzee, and Orang; whilst the lower quadrumanous characters exhibited by the cæcum and nates were exhibited by the smaller-brained and longer-armed but rounder-skulled and shorter-jawed Gibbons.

Pursuing the comparison through the complexities of the bony framework, he might first glance at the more obvious proportions, and such, indeed, as would be given by the entire animal. The characteristics of the limbs in Man are their near equality of length, but the lower limbs are the longest. The arms in Man hang down to below the middle of the thigh; in the Gorilla they attain the knee; in the Chimpanzee they reach below the knee; in the Orang they touch the ankle; in the Siamang they reach the sole; in most Gibbons the whole palm can be applied to the ground without the trunk being bent forward beyond its naturally inclined position on the legs. These gradational differences coincide with other characters determining the relative proximity to Man of the Apes compared. In no *Quadrumana* does the humerus so much exceed the ulna in length as in Man; only in the most anthropoid, viz. the Gorilla and Chimpanzee, does it at all exceed the ulna in length; in the rest, as in the lower quadrupeds, the fore-arm is longer than the arm.

The humerus, in the Gorilla, though less long, compared with the ulna, than in Man, is longer than in the Chimpanzee; in the Orang it is shorter than the ulna; in the Siamang and other Gibbons it is much shorter: the peculiar reach of grasp in those "long-armed" Apes is chiefly due to the excessive length of the antibrachial bones.

The difference in the length of the upper limbs, as compared with the trunk, is but little between Man and the Gorilla. The elbow-joint, in the Gorilla, as the arm hangs down, is opposite the "labrum ilii," the wrist opposite the "tuber ischii"<sup>1</sup>; it is rather lower down in the Chimpanzee; it is opposite the knee-joint in the Orang; it is opposite the ankle-joint in the Siamang.

Man's perfect hand is one of his peculiar physical characters: that perfection is mainly due to the extreme differentiation of the first from the other four digits, and its concomitant power of opposing them as a perfect thumb. A partially opposable thumb is present in the hand of most *Quadrumana*, but it is usually a small appendage compared with that of Man. Small as it is in the Gorilla, it is relatively largest in that species. In this Ape the thumb reaches to a little beyond the base of the first phalanx of the fore-finger; it does not reach to the end of the metacarpal bone of the fore-finger in the Chimpanzee, Orang, or Gibbon; it is relatively smallest in the last tailless Ape. In Man the thumb extends to or beyond the middle of the first phalanx of the fore-finger. The philosophical zoologist will see great significance in the results of this comparison. Only in the Gorilla and Chimpanzee are the carpal bones eight in number, as in Man; in the Orangs and Gibbons they are nine in number, as in the tailed Monkeys.

<sup>1</sup> Memoir, No. VII. pl. 13. fig. 2.

The scapulæ are broader in the Gorilla than in the Chimpanzee, Orang, or long-armed Apes; they come nearer to the proportions of that bone in Man<sup>1</sup>. But a more decisive resemblance to the Human structure is presented by the iliac bones<sup>2</sup>. In the Gorilla they bend forward, so as to produce a pelvic concavity; and in no other Ape are they so broad in proportion to their length as in the Gorilla. In *Troglodytes niger* and *Pithecus Satyrus*<sup>3</sup> the iliac bones are flat, or present a concavity rather at the back than at the fore part. In the Siamang they are not only flat, but are narrower and longer, resembling the iliac bones of tailed Monkeys and ordinary quadrupeds.

The lower limbs, though characteristically short in the Gorilla, are longer in proportion to the upper limbs than in the Chimpanzee; they are much longer in that proportion and more robust than in the Orangs or Gibbons. But the guiding-points of comparisons here are the heel and the hallux.

The heel in the Gorilla makes a more decided backward projection than in the Chimpanzee<sup>4</sup>; the heel-bone is relatively thicker, deeper, more expanded vertically at its hind end, besides being fully as long, relatively, as in the Chimpanzee. Among all the tailless Apes the calcaneum in the Siamang and other Gibbons least resembles in its shape or proportional size that of Man.

Although the foot be articulated to the leg with a slight inversion of the sole in the Gorilla, it is more nearly plantigrade than in the Chimpanzee. The Orang departs far, and the Gibbons farther, from the Human type in the inverted position of the foot.

The great toe, which forms the fulcrum in standing or walking, is, perhaps, the most characteristic peculiarity in the Human structure; it is that modification which differentiates the foot from the hand, and gives the character to the order *Bimana*. In the degree of its approach to this development of the hallux the quadrumanous animal makes a true step in affinity to Man.

The Orang-utan and the Siamang, tried by this test, descend far and abruptly below the Chimpanzee and Gorilla in the scale. In the Orang the hallux does not reach to the end of the metacarpal of the second toe; in the Chimpanzee and Gorilla it reaches to the end of the first phalanx of the second toe; but in the Gorilla the hallux is thicker and stronger than in the Chimpanzee. In both, however, it is a true thumb, by position, diverging from the other toes, in the Gorilla, at an angle of 60 degrees from the axis of the foot<sup>5</sup>.

Man has twelve pairs of ribs; the Gorilla and Chimpanzee have thirteen pairs; the Orangs have twelve pairs; the Gibbons have thirteen pairs. Were the naturalist to trust to this single character, as some have trusted to the cranio-facial one, and in equal ignorance of the real condition and value of both, he might think that the Orangs (*Pithecus*) were nearer akin to Man than the Chimpanzees (*Troglodytes*) are.

<sup>1</sup> Memoir, No. VII. pl. 1.

<sup>2</sup> *Ib.* pl. 6.

<sup>3</sup> Memoir, No. I. Trans. Zool. Soc. vol. i. pl. 50.

<sup>4</sup> Compare Memoir, No. I. pl. 49, with Memoir, No. VII. pl. 13. fig. 2.

<sup>5</sup> Memoir, No. VII. pl. 11. fig. 2.

But Man has sometimes a thirteenth pair of ribs; and what we term "ribs" are but vertebral elements or appendages common to nearly all the true vertebræ in Man, and only so called when they become long and free. The genera *Homo*, *Troglodytes*, and *Pithecus* have precisely the same number of vertebræ: if *Troglodytes*, by the development and mobility of the pleurapophyses of the twentieth vertebra from the occiput, seem to have an additional thoracic vertebra, it has one vertebra less in the lumbar region. So, if there be, as has been observed, a difference in the number of sacral vertebræ, it is merely due to a last lumbar having coalesced with what we reckon as the first sacral vertebra in Man.

The thirteen pairs of ribs, therefore, in the Gorilla and Chimpanzee are of no weight as against the really important characters significative of affinity with the Human type. But, supposing the fact of any value, how do the advocates of the superior resemblance of the Siamang's or Gibbon's skeleton to that of Man dispose of the thirteenth pair of ribs in the long-armed Apes?

In applying the characters of the skull to the determination of the important question at issue, those must first be ascertained by which the genus *Homo* trenchantly differs from the genus *Simia* of Linnæus. To determine these osteal distinctions, I have compared the skulls of many individuals of different varieties of the Human race, together with those of the male, female, and young of species of *Troglodytes*, *Pithecus*, and *Hylobates*; and I refer to the 'Catalogue of the Osteological Series in the Museum of the Royal College of Surgeons,' 4to, 1853, for the detailed results of these comparisons. On the present occasion I restrict myself to a few of these results.

The first and most obvious differential character is the globular form of the brain-case, and its superior relative size to the face, especially the jaws, in Man. But this, for the reasons already assigned, is not an instructive or decisive character, when comparing quadrumanous species, in reference to the question at issue. It is exaggerated in the human child, owing to the acquisition of its full or nearly full size by the brain, before the jaws have expanded to lodge the second set of teeth. It is an anthropoid character in which the *Quadrumana* resemble Man, in proportion to the diminution of their general bulk. If a Gorilla with milk-teeth (Pl. XLIX. figs. 3 & 4) have a somewhat larger brain and brain-case than a Chimpanzee at the same immature age (*ib.* figs. 1 & 2), the acquisition of greater bulk by the Gorilla, and of a more formidable physical development of the skull, in reference to the great canines in the male, will give to the Chimpanzee the appearance of a more anthropoid character which really does not belong to it—which could be as little depended upon in a question of precise affinity as the like more anthropoid characters of the female as compared with the male Gorilla or Chimpanzee.

Much more important and significant are the following characters of the Human skull:—the position and plane of the occipital foramen; the proportional size of the condyloid and petrous processes; the mastoid processes, which relate to balancing the

head upon the trunk in the erect attitude; the small premaxillaries and concomitant small size of the incisor teeth as compared with the molar teeth. The latter character relates to the superiority of the psychological over the physical powers in Man: it governs the feature in which Man recedes from the brute; as does also the prominence of the nasal bones in most, and in all the typical, races of Man. The somewhat angular form of the bony orbits, tending to a square, with the corners rounded off, is a good Human character of the skull, which is difficult to comprehend as an adaptive one, and therefore the better in the present inquiry. The same may be said of the production of the floor of the tympanic or auditory tube into the plate called "vaginal."

Believing the foregoing to be sufficient to test the respective degrees of affinity to Man within the limited group of *Quadrupedia* to which it is proposed, in the present Memoir, to apply them, the argument need not be diluted by citing minor characters. The question at issue is the respective degrees of affinity as between the anthropoid Apes and Man. Cuvier deemed the Orang (*Pithecus*) to be nearer akin to Man than the Chimpanzee (*Troglodytes*) is. That belief has long ceased to be entertained. I proceed, therefore, to compare the Gorilla, Chimpanzee, and Gibbon, in reference to their Human affinities.

Most naturalists entering upon this question would first look to the premaxillary bones, or, owing to the early confluence of those bones with the maxillaries in the Gorilla and Chimpanzee, to the part of the upper jaw containing the incisive teeth, on the size and direction of which depends the prognathic or brutish character of a skull. Now the extent of the premaxillaries below the nostril is not only relatively but absolutely less in the Gorilla, and consequently the profile of the skull is less convex at this part, or less "prognathic," than in the Chimpanzee. Notwithstanding the degree in which the skull of the Gorilla surpasses in size that of the Chimpanzee, especially when the two are compared on a front view, the breadth of the premaxillaries and of the four incisive teeth is the same in both. In the relative degree, therefore, in which these bones are smaller than in the Chimpanzee, the Gorilla, in this most important character, comes nearer to Man. In the Gibbons the incisors are relatively smaller than in the Gorilla, but the premaxillaries bear the same proportional size in the adult male Siamang.

Next, as regards the nasal bones. In the Chimpanzee, as in the Orangs and Gibbons, they are as flat to the face as in any of the lower *Simiæ*. In the Gorilla the median coalesced margins of the upper half of the nasal bones are produced forward, in a slight degree it is true, but affording a most significant evidence of nearer resemblance to Man. In the same degree they impress that anthropoid feature upon the face of the living Gorilla. In some pig-faced Baboons there are ridges and prominences in the naso-facial part of the skull, but they do not really affect the question as between the Gorilla and Chimpanzee. All naturalists know that the Semnopithecques of Borneo have long noses; but the probosciform appendage which gives so ludicrous a mask to those Monkeys is unaccompanied by any such modification of the nose-bones as gives the true anthropoid



character to the Human skull, and to which only the Gorilla, in the Ape-tribe, makes any approximation.

No Orang, Chimpanzee, or Gibbon shows any rudiment of mastoid processes; but they are present in the Gorilla, smaller indeed than in Man, but unmistakeable; they are, as in Man, cellular, pneumatic, and with a thin outer plate of bone. This fact led me, in a former memoir, to express, when, in respect to the Gorilla, I only knew the skull, the following inference, viz.—“from the nearer approach which the Gorilla makes to Man, in comparison with the Chimpanzee or Orang, in regard to the mastoid processes, that it assumed more nearly and more habitually the upright attitude than those inferior antropoid Apes do<sup>1</sup>.” This inference has been fully borne out by the rest of the skeleton of the Gorilla, subsequently acquired.

In the Chimpanzee, as in the Orangs, Gibbons, and inferior *Simiæ*, the lower surface of the long tympanic or auditory process is more or less flat and smooth, developing in the Chimpanzee only a slight tubercle, anterior to the stylohyal pit. In the Gorilla the auditory process is more or less convex below, and develops a ridge, answering to the vaginal process, on the outer side of the carotid canal. The processes posterior and internal to the glenoid articular surface are better developed, especially the internal one, in the Gorilla than in the Chimpanzee; the ridge which extends from the ectopterygoid along the inner border of the foramen ovale terminates in the Gorilla by an angle or process answering to that called “styloform” or “spinous” in Man, but of which there is no trace in the Chimpanzee, Orang, or Gibbon.

The orbits have a full oval form in the Orang; they are almost circular in the Chimpanzee and Siamang, more nearly circular and with a more prominent rim in the smaller Gibbons; in the Gorilla alone do they present the form which used to be deemed peculiar to Man. There is not much physiological significance in some of the latter characters, but, on that very account, I deem them more instructive and guiding in the actual comparison.

The occipital foramen is nearer the back part of the cranium, and its plane is more sloping, less horizontal, in the Siamang, than in the Chimpanzee and Gorilla. Considering the less relative prominence of the fore part of the jaws in the Siamang as compared with the Chimpanzee, the occipital character of that Gibbon and of other species of *Hylobates* marks well their inferior position in the quadrumanous scale.

In the greater relative size of the molars, compared with the incisors, the Gorilla makes an important closer step towards Man than does the Chimpanzee. The molar teeth are relatively so small in the Siamang, that, notwithstanding the small size of the incisors, the proportion of those teeth to the molars is only the same as in the Gorilla: in other Gibbons (*Hylobates lar*), the four lower incisors occupy an extent equal to that of the first four molars, in the Chimpanzee equal to that of the first three molars, in the Siamang equal to that of the first two molars and rather more than half of the

<sup>1</sup> Trans. Zool. Soc. vol. iii. p. 409.

third, in Man equal to the first two molars and half of the third: in this comparison the term 'molar' is extended to the bicuspid.

The proportion of the ascending ramus to the length of the lower jaw tests the relative affinity of the tailless Apes to Man.

In a profile of the lower jaw, I compare the line drawn vertically from the top of the coronoid process to the horizontal length along the alveoli; in Man and the Gorilla it is about  $\frac{7}{10}$ ths, in the Chimpanzee  $\frac{6}{10}$ ths, in the Siamang it is only  $\frac{4}{10}$ ths of the length of the jaw. The Siamang further differs in the shape and production of the angle of the jaw, and in the shape of the coronoid process, approaching the lower *Simiæ* in both these characters. In the size of the post-glenoid process, in the shape of the glenoid cavity, which is almost flat, in the proportional size of the petrous bone, and in the position of the foramen caroticum, the Siamang departs further from the Human type, and approaches nearer that of the tailed *Simiæ*, than the Gorilla does, and in a marked degree.

Every legitimate deduction from a comparison of cranial characters makes the tailless *Quadrumanæ* recede from the Human type in the following order:—Gorilla, Chimpanzee, Orang, Gibbons; and the last-named in a greater and more decided degree.

These comparisons have of late been invested with additional interest from the discoveries of remains of quadrumanous species in different members of the tertiary formations.

The first quadrumanous fossil, the discovery of which by Lieuts. Baker and Durand is recorded in the 'Journal of the Asiatic Society of Bengal' for November 1836, has proved to belong, like subsequently discovered quadrumanous fossils in the Sewalik (probably miocene) tertiaries, to the Indian genus *Semnopithecus*. The Monkey's molar tooth from the pliocene beds of Essex is most closely allied to the *Macacus sinicus*<sup>1</sup>. The remains of the large Monkey, 4 feet in height, discovered in 1839 by Dr. Lund in a limestone-cavern in Brazil was shown by its molar dentition ( $p. \frac{2-3}{3-3}$ ,  $m. \frac{3-3}{3-3}$ ) to belong to the platyrrhine family now peculiar to South America. The lower jaw and teeth of the small quadrumane discovered by M. Lartet in a miocene bed of the South of France, and described by him and De Blainville<sup>2</sup>, are so closely allied to the Gibbons, as scarcely to justify the generic separation which has been made for it under the name *Pliopithecus*.

The fossil femur from the miocene of Eppelsheim, recognized as quadrumanous by Professor Kaup, proves, upon comparison, to be most like the femur in the Gibbons<sup>3</sup>.

The quadrumanous fossils from the miocene beds of Pikermi are referred by Wagner to a genus *Mesopithecus*, more allied to *Semnopithecus* than to *Hylobates*<sup>4</sup>.

<sup>1</sup> Owen's 'British Fossil Mammals and Birds,' p. xlvi. figs. 1-4.

<sup>2</sup> 'Ostéographie,' fasc. iv., "Primates Fossiles," p. 54.

<sup>3</sup> Trans. Zool. Soc. vol. v. pt. i. p. 18.

<sup>4</sup> 'Die fossilen Knochen-Ueberreste von Pikermi,' 4to, 1854.

The lower molar teeth from the eocene sand at Kyson, Suffolk, which at the time of their discovery most

Finally, a portion of a lower jaw with teeth and the shaft of a humerus of a quadrumanous animal (*Dryopithecus*), equalling the size of those bones in Man, have been discovered by M. Fontan, of Saint-Gaudens, in a marly bed of upper miocene age, forming the base of the plateau on which that town is built. The molar teeth present the type of grinding surface of those of the Gibbons (*Hylobates*), and, as in that genus, the second true molar is larger than the first, not of equal size, as in the Human subject and Chimpanzee. The premolars have a greater antero-posterior extent, relatively, than in the Chimpanzee, and in this respect agree more with those in the Siamang. The first premolar has the outer cusp raised to double the height of that of the second; its inner lobe is less developed than in the Gorilla, certainly less than in the Chimpanzee. The posterior talon of the second premolar is more developed, and consequently the fore-and-aft extent of the tooth is greater, than in the Chimpanzee; thereby the second premolar of *Dryopithecus* more resembles that in *Hylobates*, and departs further from the Human type.

The canine, judging from the figures published by M. Lartet<sup>1</sup>, seems to be less developed than in the male Chimpanzee, Gorilla, or Orang, in which character the fossil, if it belonged to a male, makes a nearer approach to the Human type; but it is one which many of the inferior Monkeys also exhibit, and is by no means to be trusted as significant of true affinity, supposing even the sex of the fossil to be known as being male.

The shaft of the humerus, found with the jaw, is peculiarly rounded, as it is in the Gibbons and Sloths, and offers none of those angularities and ridges which make the same bone in the Chimpanzee and Orang come so much nearer in shape to the humerus of the Human subject. The fore part of the jaw, as in the Siamang, is more nearly vertical than in the Gorilla or Chimpanzee; but whether the back part of the jaw may not have departed in a greater degree from the Human type than the fore part approaches it, as is the case in the Siamang, the state of the fossil does not allow of determining. One significant character is, however, present—the shape of the fore part of the coronoid process. It is slightly convex forwards, which causes the angle it forms with the alveolar border to be less open. The same character is present in the Gibbons. The front margin of the lower half of the coronoid process in Man is concave, as it is likewise in the Gorilla and Chimpanzee. I am, however, acquainted with this interesting fossil, referred to a genus called *Dryopithecus*, only by the figures published in the 43rd volume of the 'Comptes Rendus de l'Académie des Sciences.' From these it appears that the canine, two premolars, and first and second true molars are in place; the socket of the third molar is empty, but widely open above; from which it

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closely resembled those of a small *Macacus* (September 1839, Magazine of Nat. Hist. p. 446), have since been matched by the lower molars of the extinct genus *Hyrcotherium*, subsequently discovered, and determined by the dentition of both upper and lower jaws. (Annals of Nat. Hist. 1841 & 1862.)

<sup>1</sup> Comptes Rendus de l'Académie des Sciences, Paris, vol. xliii.

may be concluded that the third molar had also cut the gum, the crown being completed, but not the fangs. If the last molar had existed as a mere germ, it would more probably have been preserved in the substance of the jaw.

In a young Siamang, with the points of the permanent canines just protruding from the socket, the crown of the last molar is complete, and on a level with the base of that of the penultimate molar; whence I infer that the last molar would have cut the gum as soon as, if not before, the crown of the canine had been completely extricated. This dental character, the conformation and relative size of the grinding teeth, especially the fore-and-aft extent of the premolars, all indicate the close affinity of the *Dryopithecus* with the *Pliopithecus* and existing Gibbons; and this, the sole legitimate deduction from the maxillary and dental fossils, is corroborated by the fossil humerus, fig. 9, in the above-cited Memoir.

There is no law of correlation by which, from the portion of jaw with teeth of the *Dryopithecus*, can be deduced the shape of the nasal bones and orbits, the position and plane of the occipital foramen, the presence of mastoid and vaginal processes, or other cranial characters determinative of affinity to Man; much less any ground for inferring the proportions of the upper to the lower limbs, of the humerus to the ulna, of the pollex to the manus, or the shape and development of the iliac bones. All those characters which do determine the closer resemblance and affinity of the genus *Troglo-dytes* to Man, and of the genus *Hylobates* to the tailed Monkeys, are at present unknown in respect of the *Dryopithecus*. A glance at fig. 5 (*Gorilla*) and fig. 7 (*Dryopithecus*) of the plate of M. Lartet's memoir would suffice to teach their difference of bulk, the *Gorilla* being fully one-third larger. The statement that the parts of the skeleton of the *Dryopithecus* as yet known, viz. the two branches of the lower jaw and the humerus, "are sufficient to show that in anatomical structure, as well as stature, it came nearer to Man than any quadrumanous species, living or fossil, before known to zoologists<sup>1</sup>," is without the support of any adequate fact, and in contravention of most of those to be deduced from M. Lartet's figures of the fossils. Those parts of the *Dryopithecus* merely show—and the humerus in a striking manner—its nearer approach to the Gibbons; the most probable conjecture being that it bore to them, in regard to size, the like relations which Dr. Lund's *Protopithecus* bore to the existing *Mycetes*. Whether, therefore, strata of such high antiquity as the miocene may reveal to us "forms in any degree intermediate between the Chimpanzee and Man" awaits an answer from discoveries yet to be made; and the anticipation that the fossil world "may hereafter supply new osteological links between Man and the highest known Quadrumana"<sup>2</sup> must be kept in abeyance until that world has furnished us with the proofs that a species did formerly exist which came as near to Man as does the Orang, the Chimpanzee, or the *Gorilla*.

<sup>1</sup> Sir Charles Lyell, 'Supplement to the Fifth Edition of Manual of Elementary Geology,' 8vo, 1859, p. 14.

<sup>2</sup> Ibid.



Of the nature and habits of the last-named species, which offers the nearest approach to Man of any known Ape, recent or fossil, but with an interval far exceeding that between any two members of the quadrumanous series, I have received many statements from individuals resident at or visitors to the Gaboon, and have given careful consideration to those in print, from which I should select the following as most probable or least questionable.

Gorilla Land is, for the most part, a richly or densely wooded extent of the western part of Africa, traversed by the tributaries of the rivers Gaboon, Muni or Danger, and Fernandes Vas, extending from the equator to from 10° to 15° northward and southward. The port from which the first and most of the subsequent specimens of *Troglodytes Gorilla* have been shipped is the Gaboon.

The animal is most likely to be met with in the loneliest and darkest parts of the forest; it prefers the densely wooded valleys, but also is found or heard upon the high plains and rugged heights at the fruiting of certain shrubs or trees there growing; it is usually near, seldom far from, a plentiful supply of water.

Among the trees which afford sustenance to the Gorillas have been specified the Palm-nut (*Elæis guineensis*), of which the fruit and upper part of the stipe, called the "cabbage," are eaten by them, the Papaw-tree (*Carica papaya*), the Banana (*Musa sapientum*), and another new species (*Musa paradisiaca*), the *Amomum Afzelii*, and *Amomum grandiflorum*.

The wild sugar-canes (*Arundo saccharifera*), growing near deserted huts or villages of the natives, attract the Gorillas. The succulent white parts of pine-apple leaves,—various wild forest berries, especially the kinds that grow on low bushes,—a pulpy pear-shaped subacid fruit, growing close to the ground, called the 'Tondo' by the natives,—the pith of some trees,—a kind of nut with a very hard shell, to break which requires the strength of jaw and teeth which is found in both sexes,—such fruits and other productions of the vegetable kingdom constitute the staple food of the Gorilla. The molar teeth, which alone truly indicate the diet of an animal, accord with the statements as to the frugivorous character of this great Ape; but they also sufficiently answer to an omnivorous habit to suggest that a certain proportion of animal matter, such as the eggs and callow brood of birds, might not be unacceptable.

Mr. du Chaillu, however, states that he examined the stomachs of the Gorillas killed by himself and his hunters, and "never found traces there of aught but berries, pine-apple leaves, and other vegetable matter<sup>1</sup>." The Gorilla is a huge feeder, as its vast paunch, protruding when it stands upright, shows; "and indeed," as Mr. du Chaillu well remarks, "its great frame and enormous muscular development could not be supported on little food<sup>2</sup>." The same traveller refers to this necessity for abundance of the appropriate vegetable food the restless and nomadic habits of the Gorilla, "wandering from place to place, and scarce ever found for two days together in the same neighbourhood<sup>3</sup>."

The young and the females sleep in trees; the heavier and more bulky males are

<sup>1</sup> 'Explorations and Adventures in Equatorial Africa,' 8vo, 1861, p. 348.

<sup>2</sup> Ibid.

<sup>3</sup> Ibid.

mostly on the ground; and Mr. du Chaillu, in accordance with my inference from the state of the hair in the specimens which I had examined in 1859<sup>1</sup>, testifies that the male "sleeps seated with his back against the tree-trunk."

The voice of the male Gorilla is a very loud "barking roar:" "it begins with a sharp bark, like an angry dog, then glides into a deep-bass *roll* like distant thunder along the sky, for which I have sometimes mistaken it when I did not see the animal. So deep is it, that it seems to proceed less from the mouth and throat than from the deep chest and vast paunch<sup>2</sup>."

The capacity of chest, girdled by an extra pair of ribs, gives countenance to this testimony of the power and quality of voice.

The female and young scream when alarmed, and the mother utters also a low kind of cluck to call or warn her young one. The Gorilla is not gregarious: it is monogamous: but one female is found with the male, and he is often companionless. "Young Gorillas I found sometimes in companies of five or less, but never more<sup>3</sup>." "The young always run off, on all-fours, shrieking with fear. They are difficult to approach, as their hearing is acute." "The adult animal is also shy. When the mother runs off from the hunter, the young one grasps her about the neck and hangs beneath her breasts with its little legs about her body<sup>4</sup>."

The absence of the Lion in the Gorilla-forests leaves this powerful Ape the mastery of his habitat, if, indeed, his presence may not account for the absence of the so-called "king of beasts."

The tracks of the Gorillas observed by Mr. du Chaillu showed that they went on all-fours, with evidence of occasional rest, as when tempted by wild sugar-cane or other favourite food; and he describes it as the usual mode of progression. The body is carried half erect, the hind legs moved with a swing between the arms, as on crutches, and those somewhat bowed outward<sup>5</sup> (Pl. XLIV. fig. 1). The hind feet leave no traces of any of the toes, except the great inner one or 'hallux.' The broad impressions of the digital callosities of the fore-hand leave slight marks of their distinctness. When alarmed, the hind limbs take a greater share in flight; but the body is inclined forward, and no doubt the fore limbs assist in the more rapid movement. When progressing on the lower limbs only, the "walk is a waddle from side to side:" these being somewhat inadequate to the proper support of the huge superincumbent body, he balances himself by swinging his arms, or clasping them behind the head.

When so pursued as to be driven to stand at bay, the Gorilla, like the Bear, raises himself on his hind feet, with his powerful arms and hands free for the combat. In this predicament Mr. du Chaillu affirms that the creature "offers defiance by beating his breast with his huge fists, till it resounds like a bass-drum<sup>6</sup>." There is nothing in the struc-

<sup>1</sup> Proc. Zool. Soc., January 1859, p. 19.

<sup>2</sup> Du Chaillu, 'Explorations and Adventures in Equatorial Africa,' p. 70.

<sup>4</sup> Ib. p. 352.

<sup>5</sup> Ib. p. 352.

<sup>3</sup> Ibid.

<sup>6</sup> Ib. p. 70.

ture of the Gorilla, save the size and depth of the chest, to suggest or accord with this peculiar action. Nor, were the dog as rare a beast, is there anything in its anatomy that would have suggested, to one who had never seen it alive, its occasional habit of running on three legs. In statements of this kind by a traveller, it is neither wise to discredit nor implicitly to believe; but one may acquiesce, and wait the report of succeeding observers whose attention has been directed to the original statement. Laceration of the abdomen and laying bare part of the intestines are described as the effects of a blow of the immense hand of the Gorilla<sup>1</sup>. In an instance where the Negro hunter had been so felled, the Ape vented its rage upon the musket<sup>2</sup>. This is a probable incident, and the power of the upper limb is equal to the alleged effect of its stroke. Mr. du Chaillu also adduces the testimony of the natives, that, when stealing through the gloomy shades of the tropical forest, they become sometimes aware of the proximity of one of these frightfully formidable Apes by the sudden disappearance of one of their companions, who is hoisted up into the tree, uttering, perhaps, a short choking cry. In a few minutes he falls to the ground a strangled corpse. The Gorilla, watching his opportunity, has let down his huge hind hand, seized the passing Negro by the neck with vice-like grip, has drawn him up to higher branches, and dropped him when his struggles had ceased. Describing the effect of contemplation of the recently killed male, he writes:—"There is no doubt the Gorilla *can* do this, but that he does it I do not believe. They are ferocious, mischievous, but not carnivorous<sup>3</sup>." The original report, however, does not assign any other purpose in the strangulation of a Negro pursuer or persecutor, except to kill him. In reference to the mode of attack described by Du Chaillu, viz. "to strike one or two blows, leaving the prostrate victim," Bowdich's brief hearsay testimony in the main accords with this direct one. In the 'Narrative of a Mission from Cape Coast Castle to Ashantee' (8vo, 1819), Bowdich writes, in reference to the vicinity of the Gaboon, "The favourite and most extraordinary subject of our conversation in natural history was the *Ingena*, an animal like the Orang Outang, but much exceeding it in size, being 5 feet high and 4 across the shoulders. Its paw was said to be even more disproportioned to its breadth, and one blow of it to be fatal. It is commonly seen by them, when they travel to Kaybe, lurking in the bush to destroy passengers," (not to eat them, for) "it feeds principally on wild honey, which abounds."

The name *Ngina* or *Gina*, in the Mpongwe dialect (pronounced *Nguyla* by some of the hunters in the interior of the Gaboon), together with the now known stature and strength of arm of the Gorilla, satisfactorily show the true species of Ape to which Bowdich's Negro gossips referred. Battel distinguishes the larger Ape (*Pongo*), of which he heard while prisoner to the Portuguese in Angola, or wandering amongst the Negroes of the interior, as being of a dunnish colour, from the smaller one (*Engeco*), which is black.

<sup>1</sup> Du Chaillu, 'Explorations and Adventures in Equatorial Africa,' p. 287.

<sup>2</sup> *Ibid.*

<sup>3</sup> *Ib.* p. 277.

“The Pongos,” he also writes, “are never taken alive, because they are so strong that ten men cannot hold one of them,” which is true of the Gorilla; while the black *Engeco* (the *Enche-eko*, or *Nstiego*, of the Mpongwe and Camma tribes of the present day) would offer less resistance, through its smaller size and weaker structure. Very significant of the accuracy of the report of the old African wanderer is the indication of the difference of colour of the “Pongo” and “Engeco.” In this narrative<sup>1</sup> is the first notice of the Gorilla under the name of “Pongo.” ‘Hanno’s Voyage<sup>2</sup>,’ from which Dr. Savage borrowed the name, too vaguely refers to some large hairy Ape for identification of the species. But Cuvier acted in the true interests of science in excluding the hearsay evidences on record prior to the publication of the ‘*Règne Animal*’ from that trustworthy compendium of zoological facts.

From present knowledge of the characters of the Gorilla, its position in the zoological series may be deduced; but the conclusions will bear some tincture of the mind that so deals with such evidence, and consequently, as heretofore, those entitled to offer an opinion may, for some time to come, be found to differ.

I would first observe, although to most it may be superfluous, and to every competent and candid naturalist it ought to be so, that characters of homology are not to be confounded with those of zoology. For example, if, in the accepted zootomical text-books<sup>3</sup>, every bone in the foot of Man is shown to be present in the hind hand of the Monkey and in the hind fin of the Seal, the tyro in zoology is not to believe that the

<sup>1</sup> Battel’s narrative is contained in the compilation by Purchas, entitled ‘*Pilgrimages, or Relations of the World*,’ &c., fol., 1625, pt. ii. p. 981.

<sup>2</sup> The ‘*Periplus, or Voyage of Hanno*,’ was translated by a learned and accomplished physician, Dr. Falconer (8vo, 1797). I am indebted to the venerable Bishop Maltby, eminent as a Greek scholar, for the following translation of the passage supposed to allude to the species in question:—“On the third day, having sailed from thence, passing the streams of fire, we came to a bay called the Horn of the South. In the recess there was an island like the first, having a lake, and in this there was another island full of wild men. But much the greater part of them were women, with hairy bodies, whom the interpreters called ‘Gorillas.’ But, pursuing them, we were not able to take the men; they all escaped, being able to climb the precipices, and defended themselves with pieces of rock. But three women (females), who hit and scratched those who led them, were not willing to follow. However, having killed them, we flayed them, and conveyed the skins to Carthage; for we did not sail any further, as provisions began to fail.” This encounter indicates, therefore, the southernmost point on the west coast of Africa reached by the Carthaginian navigator.

To the inquiry by Bishop Maltby, how far the newly discovered great Ape of Africa bore upon the question of the authenticity of the ‘*Periplus*,’ I replied:—“The size and form of the great Ape, now called ‘Gorilla,’ would suggest to Hanno and his crew no other idea of its nature than that of a kind of human being; but the climbing-faculty, the hairy body, and skinning of the dead specimens strongly suggest that they were large anthropoid or tailless Apes. The fact that such Apes, having the closest observed resemblance to the Negro, being of human stature and with hairy bodies, do still exist on the west coast of Africa renders it highly probable that such were the creatures which Hanno saw, captured, and called ‘Gorullai.’”

<sup>3</sup> Cuvier, ‘*Leçons d’Anatomie Comparée*,’ 8vo, 1805, tom. i. art. vii., “Des os du coude-pied, ou du tarse, dans l’Homme et dans les Mammifères”; ‘*Ossemens Fossiles*,’ 4to, 1825, tom. v. partie vii., “Squelettes des Phoques,” p. 226, &c.



characters which the modifications of these several structures afford lose any of their value, in a classificatory science, through the fact of their being superinduced upon a common type. The Seal retains as strongly the peculiarity of the swimming-limb; the Ape has its equally distinctive climbing-limb; and, in like manner, Man stands alone in the possession of limbs for upright station and bipedal progression. Although the "astragalus," "hallux," &c., may be determinable in most Mammalia, a "foot," properly so called, is nevertheless peculiar and common to mankind.

So with the brain and most other organs, although the homologues of the parts in Man may not be traceable to the same extent down the mammalian series. Kuhl, e. g., in *Ateles Belzebuth*<sup>1</sup>, Tiedemann in the Macaque<sup>2</sup> and Orang<sup>3</sup>, Van der Kolk and Vrolik in the Chimpanzee<sup>4</sup>, and myself in the Gorilla<sup>5</sup>, have severally shown all the homologous parts of the Human cerebral organ to exist, under modified forms and grades of development, in Quadrumana. Nevertheless the distinctive characters of the Human brain, such as the manifold and complex convolutions of the cerebral hemispheres, their extension in advance of the olfactory lobes and further back than the cerebellum, thereby defining a posterior lobe, with the corresponding "horn of the lateral ventricle" and "hippocampus minor," are as available to the zoologist in classification as are the equally peculiar and distinctive characters of the calcaneum, hallux, and other structures of the foot.

With regard to the brain, the first element in the present problem which that organ yields the zoologist is its early arrest of growth in the Gorilla, as compared with Man. In this respect it obeys the same developmental law as the brain in the Chimpanzee and Orang<sup>6</sup>. All Quadrumana, indeed, agree together and differ from Man in this respect.

<sup>1</sup> Beiträge zur Zoologie und vergleichenden Anatomie, 4to, 1820, zweite Abtheilung, p. 70, tab. vii.

<sup>2</sup> Icones cerebri Simiarum, fol. 1821, p. 14, fig. iii. 2.

<sup>3</sup> Treviranus, Zeitschrift für Physiologie, Bd. ii. s. 25, taf. iv.

<sup>4</sup> Nieuwe Verhandlingen der eerste Klasse van het Koninkl. Nederlandsche Instituut. Amsterdam, 1849.

<sup>5</sup> Fullerial Lectures, Royal Institution (March 18th, 1861); reported, with copies of diagrams, in 'Athenæum,' March 23rd, 1861, p. 395.

<sup>6</sup> Memoir, No. I., "Osteology of Chimpanzee and Orang-utan," 1835, Trans. Zool. Soc. vol. i. p. 355:—"The brain does not continue to expand after the development of the deciduous teeth."

See also the remarks on this subject in the memoir by Professor Eudes-Deslongchamps, who obtained for the Museum of the Faculty of Sciences at Caen (of which he is Dean) the body of the first and sole specimen of a young Gorilla which reached a European port alive. This judicious naturalist records his impressions on this point, and gives the results of his comparisons, as follows:—"L'encéphale d'un jeune Gorille, Chimpancée, ou Ourang-Outang n'atteint point à beaucoup près les dimensions d'un encéphale humain d'un âge correspondant au leur; il acquiert promptement le volume qu'il doit conserver pendant le reste de la vie; ses enveloppes osseuses ont bientôt pris une solidité et une épaisseur qui ne permettent presque plus au cerveau de grandir, tandis que chez l'homme le cerveau continue de s'accroître et ses enveloppes de se prêter à ce développement pendant un temps bien plus long que celui qui est accordé au développement du cerveau des singes anthropoïdes. La tête de ces singes, arrivée à l'âge où toutes les dents de lait sont sorties et en exercice (pls. 3-6),

The size which the brain of the Gorilla acquires in the full-grown male is illustrated by the capacity of the cranium, in the paper on that subject (No. IV.) communicated to the Zoological Society, November 11, 1851, and published, with illustrations of the vertical longitudinal sections, in the fourth volume of the 'Transactions' (Pl. XXVIII.)<sup>1</sup>. From these sections an observer, not anatomically acquainted with the disposition of the dura mater in relation to the "lateral sinuses," might infer that the cerebrum extended backward beyond the cerebellum: it is coextensive therewith in length, but not quite in breadth. The Gorilla shows the same degree of development of the "posterior cornu" and "hippocampus minor" as has been observed by Van der Kolk and Vrolik in the brain of the Chimpanzee. It is the beginning of those structures which are backwardly extended, with the parts of the hemispheres containing them, and fall short, in the same degree, of their extended and differently curved homologues, in Man. The term "rudiment," as applied to the totality of an undeveloped organ, such as the mammary organs in the male mammal, the hidden tusk in the female Narwhal, &c., cannot be applied in the same sense to the commencing extensions of homologous parts in a given direction of growth. The stunted tail of the Sloth, for example, is not the "rudiment" or undeveloped representative of the whole tail in the Megatherium; it answers only to two or three of the caudal vertebræ at the base of such tail, of which huge and complex vertebræ alone, in the Megatherium, the answerable vertebræ in the Sloth can truly be affirmed to be rudiments. The hinder thumb, in many Orangs (seven out of eight observed by Camper (*Œuvres*, tom. i. p. 54)), is not the homologue of the Human hallux, but only of its metatarsal and first phalangeal bones. The beginnings of the posterior cornua and their inflected eminences, in the Gorilla, are shown in Pl. XLVIII. fig. 3<sup>2</sup>.

To supplement the information which the partial decomposition of the exterior surface of the Gorilla's brain left incomplete, a cast was prepared of the cranial cavity of an adult male. The brain of the Gorilla, as exemplified by such cast (Pl. XLVIII.), is of a narrow-ovate form, with the small end forward: the cerebrum does not extend beyond the cerebellum; viewed with the lower surface of the medulla oblongata horizontal, it does not extend so far back as the cerebellum does. The difference of size between it and a small-sized male Negro's brain is exemplified in the subjoined admeasurements:—

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égale à peine celle d'un enfant qui vient de naître; et lorsque les dents de lait de celui-ci sont arrivées au point ou époque que je citais tout-à-l'heure pour les singes anthropoïdes, la tête de l'enfant, ou plutôt son cerveau, a acquis un volume double ou triple du cerveau des singes que je lui compare, et il doit accroître beaucoup encore." (*Bulletin de la Société Linnéenne de Normandie*, vol. vi. p. 53, 1861.)

<sup>1</sup> Reduced woodcuts of the figures were given in the report of the paper which appeared in the 'Literary Gazette,' November 15th, 1851, p. 777; that of the adult Gorilla is No. 3.

<sup>2</sup> Kuhl takes the correct view of the homologous part, which he shows in the brain of the *Ateles*, and calls it "Anfang" (commencement) "des hintern, dritten Horns des Seitenventrikels" (*op. cit.* p. 70).

|  | Gorilla. |        | Negro. |        |
|--|----------|--------|--------|--------|
|  | in.      | lines. | in.    | lines. |
| Length of cerebrum . . . . .                 | 4        | 10     | 6      | 3      |
| Breadth of cerebrum . . . . .                | 3        | 9      | 4      | 10     |
| Depth (greatest vertical diameter) . . . . . | 2        | 6½     | 4      | 6      |
| Breadth of cerebellum . . . . .              | 3        | 4      | 3      | 7      |
| Length of cerebellum . . . . .               | 1        | 10     | 2      | 3      |
| Depth of cerebellum . . . . .                | 1        | 4      | 1      | 8      |

In these admeasurements some deduction from the Gorilla's brain must be made for the thickness of the dura mater and other membranes included in the cast: that of the Negro's brain showed it stripped of its membranes; and the admeasurements are from a subject corresponding with the smallest of those figured by Tiedemann in the 'Philosophical Transactions' for 1836, pl. 31, in which the posterior cerebral lobes extend half an inch beyond the cerebellum.

Although in most cases the Negro's brain is less than that of the European, I have observed individuals of the Negro race in whom the brain was as large as the average one of the Caucasian; and I concur with the great physiologist of Heidelberg, who has recorded similar observations, in connecting with such cerebral development the fact that there has been no province of intellectual activity in which individuals of the pure Negro race have not distinguished themselves. The contrast between the brains of the Negro and Gorilla, in regard to size, is still greater in respect of the proportional size of the brain to the body—the weight of a full-grown male Gorilla being one-third more than that of an average-sized Negro.

Passing from this contrast to a comparison of the Gorilla's brain with that of other Quadrumana, we discern the importance and significance of the much greater difference between the highest Ape and lowest Man, than exists between any two genera of Quadrumana in this respect: the brain of the Gorilla, in the contraction of the anterior lobes, in the non-development of posterior lobes extending beyond the cerebellum, and in the paucity, symmetry, and relative size of the cerebral convolutions, closely accords with the brain of the Chimpanzee. From these to the Lemurs the difference of cerebral development shown in any step of the descensive series is insignificant compared with the great and abrupt rise in cerebral development met with in comparing the brain of the Gorilla with that of the lowest of the Human races. This difference parallels that in the structure of the lower limbs, especially the foot, in the Gorilla and Man; on which difference, as exemplified in the Chimpanzee and lower Apes and Monkeys, Cuvier founded the ordinal grade to which he assigned the genus *Homo*, under the term *Bimana*. The disposition of the hallux as a hinder thumb, with the concomitant modifications of the tarsal bones, are as strongly marked in the Gorilla as in any lower Quadrumane, and the contrast between the foot-structures of the Gorilla and Negro is as great.

The long-continued growth and superior size of the Human brain, more especially the superior relative size of the cerebral hemispheres and their numerous deep and complex convolutions, are associated with psychical powers, compensating for and permitting the absence of natural weapons of offence and defence; they are correlated with those modifications of the lower limbs which free the upper ones from any call to serve the body in the way of moving or supporting it, and leave them at the command of the intellect, for such purposes, in the fabrication of clothing, weapons, &c., as it may energize upon according to its measure of activity in the individual.

In investigating and studying the value and application of the cerebral characters of Man in the classification of the Mammalia, I have been led to note the relations of equivalent modifications of cerebral structure to the extent of the groups of Mammals respectively characterized by such conditions of brain. The Monotremes and Marsupials, which offer numerous extreme modifications of the limbs, all agree in possessing a brain in which there is no connecting or commissural mass of fibres overarching the lateral ventricles of the cerebrum. The surface of this part shows, however, a few symmetrical convolutions in *Echidna*<sup>1</sup> and *Macropus*, especially the largest species<sup>2</sup>; but in the majority of Marsupials the hemispheres are smooth. The "corpus callosum," or great commissure, makes its appearance abruptly in the Rats, Shrews, Bats, and Sloths, which in general organization and powers are next the "loose-brained" Marsupials or *Lyencephala*; but this commissure is associated with a similarly smooth unconvolute cerebrum, and with so small a size of the cerebrum as leaves uncovered the cerebellum and, in most, the optic lobes. Only in the largest of the "smooth-brained" group (*Lissancephala*) are a few simple, symmetrical, cerebral fissures present. I refer to my paper in the 'Proceedings of the Linnean Society,' 1837, for the summary of the characters which associate in close contiguity the Cuvierian orders *Rodentia*, *Edentata*, *Insectivora*, and *Cheiroptera*, and indicate their position as next above the Marsupials and below the other orders in the 'Règne Animal.' In almost every system of organs, except the cerebral, they offer as many and great varieties as do the *Lyencephala*: the one organ that links them together by the uniformity of its developmental grade and structural condition is the brain; whence they may be collectively spoken of as "Lissancephala," or the smooth-brained subclass with connected hemispheres.

The inference as to the respective values of 'brain,' 'teeth,' 'limbs,' &c., as mammalogical characters is plain: the most constant organ bespeaks the widest group.

In the remaining and, as I infer, higher orders of Mammalia the cerebrum presents a sudden increase of size: if, as in the diminutive Lemurs and platyrrhine Marmosets, its surface is smooth, it not only covers the optic lobes, but also more or less of the cerebellum. But, as a rule, the grey superficies of the cerebrum is expanded by convolutions<sup>3</sup>. In the platyrrhine and catarrhine *Quadrumana* the cerebrum becomes

<sup>1</sup> Cyclopædia of Anatomy and Physiology, art. "Monotremata," vol. iii. p. 383. fig. 182.

<sup>2</sup> Phil. Trans. 1837, pl. 5. fig. 4.

<sup>3</sup> Even in the Rodent-like Aye-aye.



coextensive backward with the cerebellum, and the beginning of the structures<sup>1</sup> characteristic of the posterior lobes in Man are determinable. But, for the present zoological application, the following accurate definition by Tiedemann of the Human condition of some of these structures may be relied upon:—"Pedes hippocampi minores vel unguis, vel calcaria avis, quæ a posteriore corporis callosi tanquam processus duo medullares proficiscuntur, inque fundo cornu posterioris plicas graciles et retroflexas formant, in cerebro Simiarum desunt; nec in cerebro aliorum a me examinatorum mammalium occurrunt; Homini ergo proprii sunt." ('Icones cerebri Simiarum,' p. 51.)

With regard to other characters, if the naturalist, seeking the true cerebral endowments of the genus *Homo*, were to abandon his proper guide, viz. the average condition of the brain in the male sex, and to take the brain of a female of the lowest Papuan or Ethiopian variety, he would nevertheless find that the primary cerebral convolutions characteristic of Man, and widely differentiating his brain, by their number, size, depth, and course, from the Ape's brain, are all present, though they may be marked by fewer secondary fissures<sup>2</sup>. The cerebrum not only overlaps, but extends beyond the cerebellum; and the difference in the proportion of the cerebrum to the cerebral nerves, to the pyramidal bodies, to the bigeminal bodies, to the myelon, is such as to manifest as abrupt a step in development as that which is met with between the Lyencephalous and Lissancephalous types, or between the *Lissancephala* and *Gyrencephala*. The extent of difference in the proportion of the cerebrum to the above-cited parts in the different varieties of mankind is small, and with such slight gradational steps as to mark the unity of the family in a striking manner. I therefore conclude that the Human characteristics of the brain afford a zoological character of higher degree and importance than do those of his limbs, and concur in the functional estimate with which Tiedemann terminates his paper on the brain of the Orang:—"The cerebral hemispheres are thus most clearly shown to be essentially the instruments by which, in life, the intellectual functions are performed, since through the large size, circumferential expanse, and elaboration of the cerebrum Man differs from all other animals<sup>3</sup>." It would seem, moreover, that the numbers of the *Arhencephala*, under their manifold varieties, would

<sup>1</sup> "Anfang des hintern, dritten Horns des Seitenventrikels" (Kuhl, in *Ateles*, *loc. cit.*). "Scrobiculus parvus loco cornu posterioris" (Tiedemann, in *Macacus*, 'Icones cerebri Simiarum,' fol. p. 14, fig. iii. 2). "Die grossen seitlichen Hirnhöhlen bestanden aus dreien Hörnern, einem vorderen, mittleren oder absteigenden, und einem hinteren Horn" (Tiedemann, on the Orang; who is, however, silent as to any "hippocampus minor"). It exists, however, in the condition described by Vrolik, as "une éminence que nous croyons avoir le droit de nommer un indice de pes hippocampi minor" ("Note sur l'encéphale de l'Orang," in *Versl. en meded. afd. natuirk. Deel xiii.*, 1861).

<sup>2</sup> The "primary" and "secondary" convolutions and fissures are defined and distinguished in my paper on the Cheetah (*Sept.* 1833, *Zool. Trans.* vol. i. p. 134).

<sup>3</sup> "So wird dadurch auch evidenteste bewiesen, dass die Hemisphären des grossen Hirns vorzüglich als die Werkstätte zu betrachten sind, durch welche im Leben die intellectuellen Verrichtungen vermittelt werden, dem eben durch Grösse, Umfang und Ausbildung des grossen Hirns unterscheidet sich der Mensch von allen übrigen Thieren" (*loc. cit.* p. 28). This remark antagonizes that of Buffon, who, in regard to the Orang and

soon surpass those of the kinds of *Gyrencephala*, *Lissancephala*, and *Lyencephala* now living upon the earth.

Agreeably, therefore, with the above estimate of the value of cerebral characters, the *Troglodytes Gorilla*, like the *T. niger* and the *Pithecus Satyrus*, remains with the Gibbons and lower *Quadrumana*, and stands apart in a distinct subclass from the genus *Homo*.

I next proceed to consider the value and application of the characters afforded by the limbs of the Gorilla.

In the terminal segment of the fore limb the pollex is stunted<sup>1</sup>; the other digits, lengthened and strengthened, with their proximal and especially their middle phalanges expanded for the support of the broad callosities on which the beast walks: the length of these digits enables them also to bend upon the palm and grasp or cling to a bough, and the hand is thus adapted for movement in trees, as well as for the quadrupedal progression on the ground: but, in the same degree, it is deprived of the faculty of delicate digital prehension or "manipulation." The hand of the Gorilla offers a slight advance upon the type of that in the Chimpanzee or Orang by its greater relative breadth: the entire fore or upper limb is also rather shorter in proportion to the body. Compared with the modifications of that limb in Man and the resultant powers of the member, the fore limb of *Quadrumana* appears to me to be inferior to that in *Bimana* in a greater degree than it is superior to the fore limb in the Squirrel or any pentadactyle Unguiculate: the difference between the Gorilla and Man in this particular I regard therefore as one of ordinal value. In the lower or hind limb the difference between the Gorilla and Man is still more manifest and important in its consequences. The deficiency of length in proportion to the trunk is greater than the excess of length of the upper limbs. The foot is made a true hand, or grasping organ, by the opposition of a thumb to the other digits, as well as by the length and flexibility of the toes<sup>2</sup>. Accordingly the innermost digit presents as well-marked modifications to act the part of a 'thumb' as affect it in Man in order to act the part of a 'great toe': in both cases the whole tarsus has been subject to coordinate modifications<sup>3</sup>. The other four digits in the Gorilla present a greater excess of length compared with Man than in the upper limb; they are also more approximated to each other, and are bound together in a common ligamentary sheath to nearer their extremities than in Man, and are collectively

Chimpanzee, affirms:—"Le cerveau est absolument de la même forme et de la même proportion, et il ne pense pas: y a-t-il une preuve plus évidente que la matière seule, quoique parfaitement organisée, ne peut produire ni la pensée ni la parole qui en est la signe, à moins qu'elle ne soit animée par un principe supérieur?" (Hist. Nat. xiv. p. 61.)

<sup>1</sup> In the Gorilla the length of the entire pollex only equals that of the metacarpal of the middle finger, and is rather more than three-eighths the length of that finger: in Man the pollex equals the metacarpal and nearly the whole of the first phalange of the middle finger, and is almost two-thirds the entire length of that finger, including the metacarpals in both cases. (Memoir, No. VII., Trans. Zool. Soc. vol. iv. p. 11. pl. 10.)

<sup>2</sup> Memoir, No. VII., pl. 11. fig. 2.

<sup>3</sup> *Ib.* figs. 1 & 2.

applicable to the sole in the act of grasping<sup>1</sup>: by this "syndactylous" character the toes seem to be shorter, but are made stronger for this purpose; and their length is here adverted to as it is manifested by their bones. The result is a limb adapted to functions as distinct from those of the Human leg and foot as it is from those of the Bear or Dog. If zoology assigns an ordinal value to the limb-characters which distinguish *Carnivora* from *Quadrumania*, it must, in consistency, assign the same value to the limb-characters which distinguish *Quadrumania* from *Bimana*. These distinctions are as plain in the embryo as in the adult<sup>2</sup>, and are in no way affected by the anatomical demonstrations of the homologies of the bones of the lower or hinder limb: on such ground, indeed, there could be no zoology as a classificatory science.

The Gorilla, by the legitimate application of such science, being relegated to the Quadrumanous order in the Gyrencephalous subclass of Mammalia, the question becomes narrowed to its status and affinities in such order. Before, however, entering upon this phase, I would premise a few words on the primary groups of the *Quadrumania* of Cuvier. In the second edition of the 'Règne Animal,' 1829, after remarking that the order had been divided for a long time into two groups, "les *Singes*" (*Simia*, Linn.) and "les *Makis*" (*Lemur*, Linn.), he proposes to distinguish the *Ouistitis* (*Hapale*, Illiger) as a group of equal value.

Having availed myself of the earliest opportunity to compare the brain of an *Ouistiti* (*Hapale midas*, Illig., *Midas rufimanus*, Geoffr.) with that of the *Makis*, on the one hand, and of the *Singes* on the other, I found it to agree with the latter in the backward coextension of the cerebrum with the cerebellum<sup>3</sup>. In all the *Makis* (*Lemuridæ*) about one-half or one-third of the cerebellum is left uncovered. The distinctive characters on which Cuvier relied for the separation of the *Ouistitis* were the number of the molars, nails only on the hinder thumbs, and those of the fore limbs not meriting the name of thumb<sup>4</sup>. The first of these characters as a mark of affinity to the Old-World *Simiæ* is deceptive: the number of "mâchelières" is, indeed, the same, but their kinds

<sup>1</sup> Isidore Geoffroy St.-Hilaire, lamenting "the impediments to zoological science by the deplorable vagueness pervading the meaning of the terms applied to characteristic organs," defines a "hand" as having long and flexible digits opposable to the palm or sole, so as to be able to grasp or seize an object, which, if light and moveable, can thus be brought to the mouth; if heavy and fixed, can serve as a fulcrum for moving the animal's body: he thus evades the objection based on the inadequacy of the thumb to oppose the fingers, in many *Quadrumania*. ("Remarques sur la Classification et les Caractères des Mammifères, Première Mémoire, Famille des Singes, Définition zoologique du mot 'Main,'" Archives du Muséum d'Histoire Naturelle, 4to, 1839, p. 17.)

<sup>2</sup> See Breschet, "Recherches sur la Gestation des Quadrumanes," Mém. de l'Académie des Sciences, tome xix. 1845, pl. 13. fig. 3 (Human embryo) and fig. 5 (embryo of *Simia sabæa*), at a period when the digital divisions and phalanges begin to be marked by bone, but before there is any trace of ossification in the tarsus.

<sup>3</sup> Phil. Trans. vol. cxxvii. (1837), pl. v. fig. 2 (copied in the "Classification of the Mammalia," Proc. Linn. Soc. 1857, fig. 3).

<sup>4</sup> "Ils n'ont que vingt mâchelières, comme les Singes de l'ancien continent:" "tous leurs ongles sont comprimés et pointus, excepté ceux des pouces de derrière; et leurs pouces de devant s'écartent si peu des autres doigts, qu'on ne leur donne qu'en hésitant le nom de quadrumanes" (*op. cit.* p. 105).



are different. The essential distinction in the New-World *Simiæ* is their having *three premolars*, instead of *two*, on each side of both jaws: and in this respect they show their lower grade and nearer approach to the unguiculate *Gyrencephala*. The *Ouistitis* differ in wanting a true molar on each side of both jaws: *m. 3* is undeveloped in these small and short-jawed Marmosets. The homological characters of the "mâchelières" in *Quadrumana* are given in the subjoined formulæ:—

Old-World *Simiæ*, "singés de l'ancien continent," Cuv. .  $p. \frac{2-2}{2-2}, m. \frac{3-3}{3-3} = 20$ ;

New-World *Simiæ*, "singés du nouveau continent," Cuv. .  $p. \frac{3-3}{3-3}, m. \frac{3-3}{2-3} = 24$ ;

Marmosets, "*Ouistitis*," Cuv. . . . .  $p. \frac{3-3}{3-3}, m. \frac{2-2}{2-2} = 20$ .

Thus it is seen that the *Ouistitis*, instead of resembling the Old-World Apes in dentition, differ from them in a greater degree than do the other New-World *Simiæ*: they have not only one premolar more, but one true molar less, in the dental formula. In their deciduous dentition the Marmosets correspond with the other American *Quadrumana*<sup>1</sup>.

With regard to the character which Cuvier derived from the feeble and hardly opposable anterior thumb in the *Ouistitis*, that great naturalist had remarked, in the same section of his classical work, that one of the "Sapajous" (*Mikiri*) had a very short thumb; another (*Chamek*) had the thumb still shorter, wanting the ungual phalanx and nail; and a third (*Coaiti*<sup>2</sup>) had no thumb visible. About the same period Isidore Geoffroy St.-Hilaire had generalized the fact of the inferiority of the thumb of the anterior hand, in the Howlers (*Mycetes*), Capuchins (*Cebus*), and Caparos (*Lagothrix*, Geoffr.)<sup>3</sup>.

The characters of the extremities, therefore, like those of the teeth, in the *Ouistitis*, are invalidated, and their separation as a primary group of *Quadrumana* cannot be maintained. In my 'Odontography' I adopted three primary groups of *Quadrumana*:—  
1. the Lemurids or Makis, including *Cheiromys*; 2. the New-World *Simiæ* of Cuvier,

<sup>1</sup> 'Odontography,' p. 439 (1840). The system of notation is there explained. See also 'Phil. Trans.' 1850; and the article "Teeth," 'Cyclopædia of Anatomy.' Mr. Blyth remarks, "We cannot but think that Cuvier has, in this rare instance, attached undue importance to the *number* of molar teeth, in so decidedly separating the *Ouistitis* from the other small American *Quadrumana*" (Orr's edit. of the 'Animal Kingdom,' 8vo, 1840, p. 63). The determination of the kinds of teeth confirms the suspicion.

<sup>2</sup> "Absolument sans pouce visible" (Règne Animal, i. p. 101). The metacarpal is present, but concealed by the skin.

<sup>3</sup> "*Hurleurs* ou *Alouates*:—pouce antérieur de moitié moins long que le second doigt, très-peu libre dans ses mouvemens, et à peine opposable.

"*Sajous* ou *Sapajous* proprement dits:—les pouces antérieurs sont peu allongés, peu libres dans leurs mouvemens, et peu opposable aux autres doigts; absolument comme dans les *Hurleurs* et les *Lagothriches*" (Dictionnaire Classique d'Hist. Nat. t. xv. 1829). Mr. Ogilby, by independent observations, arrived at the same conclusion as to the inferiority of the anterior thumbs in the "New-World *Simiæ*" of Cuvier, and went so far, in his application of the character, as to sever them from the other *Quadrumana* of Cuvier, and associate them with the Opossums and *Cheiromys*, in an order called *Pedimana* (Proc. of the Zool. Soc. March 1836); "Observations on the Opposable Power of the Thumb in certain Mammals" (Mag. of Nat. Hist. vol. i. 1837, p. 449).



including the *Ouistitis*; and 3. the Old-World *Simiæ*. In these Buffon<sup>1</sup> had generalized the fact of the narrow septum of the nose, as he had also that of the broad nasal septum in the New-World Monkeys. Etienne Geoffroy St.-Hilaire<sup>2</sup> invented names for the two great groups expressive of these characters, e. g. *Catarrhini* and *Platyrrhini*. Observing also a peculiar twist of the nostril in certain Lemurids, he proposed for that group the term *Strepsirrhini*, to give uniformity of nomenclature to these three divisions of the Quadrumana. The Lemurine group, including *Chiromys* and *Galeopithecus*, offers, however, exceptions to the form and position of nostrils to a degree not known in the two higher groups. The dentition and other important parts of the organization present also more and greater modifications than in the Platyrrhines and Catarrhines. The difference in the relative size of the cerebrum between any known Lemurine and the lower Platyrrhine is such as to indicate a higher degree of value to the Strepsirrhine group, and that it is more distinct from the Platyrrhine<sup>3</sup> than this is from the Catarrhine group. Moreover, the Lemurines in their diversities of organization are a less natural or circumscribed group, and their wider geographical distribution accords with this conclusion. Of all the *Gyrencephala*, they have the closest affinities with the *Lissancephala*; yet the small smooth-brained Lemurines show a larger proportional cerebrum than the Rodents or Insectivores of corresponding size<sup>4</sup>.

With these admissions, retaining the Lemurines or Strepsirrhines as a primary group and the lowest suborder of Quadrumana, I regard the Platyrrhines, or New-World *Simiæ*, and the Catarrhines, or Old-World *Simiæ*, as two other suborders, respectively more circumscribed and natural than the lower one, and more nearly allied to each other than to it.

Of the subdivisions of these suborders it is not in my present aim to say more than that I adopt as the highest group or "tribe" of Catarrhines, the *Pithecina* of Isidore Geoffroy St.-Hilaire<sup>5</sup>. To the characters of teeth (common to it with all Catarrhines)

<sup>1</sup> Histoire Naturelle, tom. xiv. p. 13.

<sup>2</sup> Annales du Muséum, tom. xix. pp. 85 & 156.

<sup>3</sup> Mr. Blyth, in Orr's edition of the 'Règne Animal,' 8vo, 1840, remarks upon the *Ouistitis*, "Their brain is surprisingly low, almost without convolutions." But, in my Memoir of 1837, it was shown that the *Midas rufimanus* was superior to the smooth-brained Rodents and Marsupials in the greater relative size of the cerebrum, which is a more important character.

<sup>4</sup> See "Memoir on the Aye-aye (*Chiromys*)," Trans. Zool. Soc. vol. v. pp. 68 & 84, pl. 24. figs. 2-5.

<sup>5</sup> Archives du Muséum d'Hist. Nat., 1839, "Sur la classification et les caractères des Mammifères, Première Mémoire, Famille des Singes."

"Tribu I. PITHECIENS, *Pithecina*: Singes à cinq molaires (32 dents en tout), à ongles courts, à membres antérieurs plus longs que les postérieurs."

Van der Hoeven, excluding *Galeopithecus* from the order, divides the Quadrumana primarily into LEMURINA seu PROSIMII and SIMLÆ. The latter group he subdivides into—

"Phalanx I. Hemipitheci.

II. Hesperopitheci.

III. Heopitheci."

The first two answer to the Platyrrhines; the third to the Catarrhines. In this arrangement the genera

and limbs which he assigns to the "tribe," may be added, as more important and distinctive, those of the skeleton, the brain, and the digestive organs. The most conspicuous of the osteological characters are the great relative breadth and flatness of the sternum, and the reduction of the caudal vertebræ to a non-projecting 'os coccygis;' the feeble met- and an-apophyses in the lumbar vertebræ contrast also with their interlocking development in lower Catarrhines. In the digestive system the absence of cheek-pouches, and presence of an 'appendix vermiformis cæci,' are characters of the *Pithecina*, Is. Geoffr. Their dental distinction is seen in the conformation of the grinding surface of the true molars, which in the lower jaw presents five low tubercles, two on the inner and three on the outer and back part, instead of their development in transverse pairs or ridges as in the lower Catarrhines. In the brain may be noticed the bipartition of the 'corpus mammillare,' and the absence of the 'trapezium' on the medulla oblongata.

Of the latisternal or broad breast-boned Apes (*Pithecina*), one section has ischial callosities, the other not. To the first belong the Gibbons or "Long-armed Apes" ('Arm-affe,' Kuhl), *Scleropyga, natibus callosis*; to the second, the true Apes ('Affe,' Kuhl)<sup>1</sup>, *Dasypyga, natibus villosis*. In the Dasypygal division the Orangs (genus *Pithecus*, Geoffr.) manifest, agreeably with their geographical position, the nearest affinities with the *Scleropyga*, in the length of the upper limbs and the proportionally small size of the hallux: the Chimpanzees (genus *Troglodytes*, Geoffr.) show the higher position in the proportions of the upper limbs to the trunk, the large size of the hallux, and other characters set forth in the present and former memoirs on the Anthropoid or Dasypygal Apes.

The Gorilla is shown, by its osteology, to appertain to the latisternal section of ecaudate Catarrhines<sup>1</sup>; and therein, by the absence of ischial callosities ("natibus tectis"), to the *Dasypyga* or true Apes, as contradistinguished from the *Scleropyga* or Gibbons ("natibus nudis, callosis").

The *Dasypyga* have been divided, as we have seen, into two genera, *Pithecus*, Geoffr., and *Troglodytes*, Geoffr. To the first belong the *Simia Satyrus* of Linnæus, or Orang-utan, characterized by long arms (reaching to the ankles), a short thumb of the hind hand, sometimes wanting the unguis phalanx and nail, never reaching the end of the metatarsal of the second toe: the ligamentum teres of the hip-joint is absent; there are twelve pairs of ribs; the superorbital ridge is slightly produced; the premaxillaries become ankylosed during the second or permanent dentition; the tuberculate grinding surface of the molars is rugose. The second genus is represented by the Chimpanzee

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*Jacchus*, Geoffroy, and *Midas*, Geoffroy, form a group equivalent to the genera *Cynocephalus*, Cuv., *Innuus*, Cuv., *Cercopithecus*, Erxl., *Semnopithecus*, F. Cuv., *Hylobates*, Illig., and *Simia*, Illig. I have therefore given, in the text, a few remarks on the value of the group formed by the last two Illigerian genera, and on the grounds for a division of *Simia*, Illig., into two genera.

<sup>1</sup> *Op. cit.*, "Tabula Synoptica Simiarum," p. 4 (1820).

(*Simia Troglodytes*, Linn., *Troglodytes niger*, Geoffr.), characterized by less long arms (reaching to the knee), a long thumb of the hind hand, never without unguinal phalanx and nail, reaching to the second joint of the second toe: the ligamentum teres is present; there are thirteen pairs of ribs; the superorbital ridge is strongly developed; the tuberculate grinding surface of the molars is smooth; the premaxillaries become anchylosed during the first or deciduous dentition. According to the above generic characters, the Gorilla belongs to the genus *Troglodytes*.

But equal value has been given to other characters, *e. g.* 1st, "to the much-elongated and much-depressed form of the head, and to the very prominent cranial crests, in the adult<sup>1</sup>."

These, however, are sexual rather than generic characters; they are present only in the adult males, and require a certain age of such adult to bear the terms in which they are expressed by Is. Geoffroy. As compared with aged adult male specimens of *Troglodytes niger*, they are differences, not of kind, but simply of degree. This degree of development of the cranial crests, with their concomitant influence on the shape of the head, moreover, accords with the difference in the size of the adult males of the Chimpanzee and Gorilla.

In every admitted natural genus of Carnivorous Unguiculates, the small species differ from the large species, just as the small kind of *Troglodytes* does from the large one, in the degree of development of the intermuscular plates of bone affording attachment to the temporal muscles.

2. "The external ear is small and of the human shape<sup>2</sup>." It is smaller in proportion to the head, and a little smaller absolutely, in the Gorilla than in the Chimpanzee: in both, the auricle is broader in proportion to its length than in Man: the space between the helix and anthelix at their upper part is much less than in Man; and the fossa of the anthelix is scarcely marked: the lobulus is rather better marked in the Gorilla (Pl. XLVII. fig. 6) than in the Chimpanzee; and this is the only notable difference in the conch or external ear of the two Apes, except size: it is a difference which, in my judgment, is of a specific, not generic value.

The third alleged generic distinction, *viz.* the greater relative length of the upper limbs<sup>3</sup>, rests, as has been already shown<sup>4</sup>, on an error of observation.

The small amount of difference may help the specific diagnosis: in the degree in which it is determinable, it places the Gorilla higher in the genus than the Chimpanzee.

<sup>1</sup> "La Gorille n'appartient point au genre *Troglodytes*: il constitue un genre distinct. Les caractères principaux de ce genre peuvent être ainsi résumés:—

"1. Tête arrondie dans le jeune âge; tête très-allongée et très-déprimée à l'état adulte: les crêtes craniennes très-saillantes" (Isid. Geoffroy St.-Hilaire, *op. cit.* p. 38).

<sup>2</sup> "2. Conques auriculaires petites et de forme humaine" (*ib.*, *op. cit.* p. 38).

<sup>3</sup> "3. Membres antérieurs longs; leur extrémité atteignant, l'animal étant debout, le milieu de la jambe" (*ib.*, *op. cit.* p. 38).

<sup>4</sup> Compare Memoir, No. VII., pl. 13. fig. 2 (Gorilla), with Memoir, No. I., pl. 48 (Chimpanzee).

4. "The anterior hands large ; the palm, especially, being as broad as long (almost exactly of the Human proportion) ; the fingers short, relatively to those of Man and the Chimpanzee<sup>1</sup>."

If the upper hands in the Gorilla and Chimpanzee are compared, as they are shown by the bony framework, they plainly, in the proportion of the thumb and the curvature and flattening of the proximal and middle digital phalanges, exhibit the same generic type ; and the difference in regard to the breadth of the metacarpus is seen to relate to the greater strength of the larger species, and to be of no higher than specific value. I find, in the recent hands, that the digital clefts of the integument are checked in both at about the same relative distance from the bases of the proximal phalanges ; the seeming shortness of the free part of the Gorilla's fingers is due to their greater thickness (Pl. XLVII. figs. 2 & 3). As to the digits ii. iii. iv. v. being really shorter than in Man, either absolutely or relatively to the breadth of the base of their metacarpus, I refer to my Seventh Memoir, plate 10. The unguual phalanges are relatively shorter ; but the other phalanges are longer, as well as broader. In the degree in which the Chimpanzee shows a greater relative length of the digits, it manifests its specific distinction, and its further departure from the Human proportions of the hand.

5. "The posterior hands elongate : the three intermediate toes (in the male) united by the teguments as far as the second phalanx<sup>2</sup>."

In the degree in which the Gorilla appears more "syndactylous" than does the Chimpanzee, with respect to the three middle toes, I cannot discern more than a specific difference, if even it be of that value. The female Gorilla agrees with the male in the structure of the foot. Both the Gorilla and Chimpanzee show their generic relationship in the proportions of the hallux (Pl. XLVII. figs. 4 & 5, *ï*) : in this respect they differ generically from the Orang-utans, as in the direction, relative position, and functions of the hallux they alike differ ordinarily from Man.

6. The sixth character<sup>3</sup> seems to have been admitted inadvertently among those which are given as proving the generic distinction of the Gorilla from the Chimpanzee. I will only observe that the nails of both fingers and toes are thicker, shorter, narrower, and more convex in both kinds of Ape than in the Human species : those of the Gorilla are shown in the above-cited figures from photographs of the animal preserved in spirits.

Isidore Geoffroy's last generic character is derived from the dentition.

7. "The canines enormous ; the incisors ranged in almost a straight line. The three lower molars elongated from before backwards, and with a 'talon.'<sup>4</sup>"

<sup>1</sup> "4. *Mains antérieures larges* : la paume en particulier presque aussi large que longue (de proportion presque exactement humaine) ; les *doigts courts* (relativement à ceux de l'Homme et du Chimpanzée)" (ib., *op. cit.* p. 38).

<sup>2</sup> "5. *Mains postérieures allongées* ; les trois doigts intermédiaires (chez le mâle) réunis par les téguments jusqu'à la seconde phalange" (ib. *op. cit.* p. 38).

<sup>3</sup> "6. *Ongles des quatre mains très-aplati*s (comme chez l'Homme et le Chimpanzée)."

<sup>4</sup> "7. *Les canines énormes* ; les incisives rangées presque en ligne droite. *Les trois machelières inférieures allongées d'avant en arrière, et à talon*" (ib., *op. cit.* p. 38). The italics throughout these quotations are as in the original.



In former memoirs I selected the best-preserved conditions of the dental series in adult males of *Troglodytes Gorilla* and *Troglodytes niger*, in expectation of demonstrating beyond cavil, by the important characters of dentition, the generic affinity of the Gorilla and Chimpanzee, and their relative position in such genus.

In Memoir III., for example<sup>1</sup>, plates 61 and 68 show the large proportion of the canines to be no generic peculiarity of the Gorilla, but to characterize almost equally the adult males of both Gorilla and Chimpanzee: even a specific difference can hardly be predicated of the two Apes in this respect. Plates 60 and 63 show their correspondence in the almost transverse arrangement of the four incisors; and, also, the specific distinction of the Gorilla in the smaller relative size of those teeth, and its resultant higher grade in the genus. The diastema between the incisors and canines is greater in the Chimpanzee than in the Gorilla, in the two skulls of the males figured.

With respect to the lower molars, I would request a reference to my Memoir, No. V.<sup>2</sup> plate 32. In both Gorilla and Chimpanzee the outer half of each molar is divided into three tubercles, the third being situated towards the middle of the back part of the crown, but so as to show it to belong to the outer rather than to the inner moiety of the crown: it is superior in size and distinctness in the last molar of the Gorilla than in that of the Chimpanzee, making the fore-and-aft extent of the crown greater in proportion to the breadth. The portion of 'cingulum' at the back part of the crown is developed into a small accessory cusp, more distinctly in the Gorilla, and yet also present in the Chimpanzee. In neither, however, is it so large or so shaped as the true 'talon' in the last lower molar of *Macacus*: it does not form part of the grinding-surface of the tooth. Every zoologist may discern the essential similarity of structure, under the slight difference of proportion, in the last lower molar of the Chimpanzee and Gorilla; and I believe the majority will concur in my estimate of the value of the differences between the lower true molars in *Troglodytes Gorilla* and *Troglodytes niger*. The most important facts which the above-cited Memoir (V.) and plates elucidate are those which show the resemblance of the pattern of the grinding-surface of the true molars in the genus *Troglodytes* to that in *Homo*, at least as it is manifested in the large grinders of an Australian aboriginal (plate 31. fig. 3).

On the above-stated grounds, therefore, I refer the Gorilla to the genus *Troglodytes*, Geoffr., to a distinct species (*T. Gorilla*, Sav.) in that genus, which species in the serial order I place above the Chimpanzee (*T. niger*, Geoffr.). The genus *Troglodytes* belongs to the 'dasypygal' section of the 'latisternal' tribe of tailless, catarrhine Quadrumana, and, in that section, ranks above the genus *Pithecus*, Geoffr. The Quadrumana are 'gyrencephalous,' and have an 'ordinal' distinction in their subclass,

<sup>1</sup> "Osteological Contributions to the Natural History of the Chimpanzees (*Troglodytes*, Geoffr.), including the description of the skull of a large species (*Troglodytes Gorilla*, Savage)," Trans. Zool. Soc. iii. 1848.

<sup>2</sup> "Osteological Contributions, &c., No. 5: Comparison of the Lower Jaw and Vertebral Column of the *Troglodytes Gorilla*, *Troglodytes niger*, *Pithecus Satyrus*, and different varieties of the Human Race," Trans. Zool. Soc. iv. 1851.

of which they form the head. *Troglodytes* differs generically, ordinally, and subclassically from *Homo*, which genus forms the sole order (Bimana) of the *Archencephala*.

In preparing the present communication for the Zoological Society, and with special reference to the primary aim of the Society—the extension of a knowledge of animals and of their place in the natural series, I have clothed the results of my observations and comparisons in the usual technical language of systematic zoology.

I am fully conscious, however, of the relative value in biological science of this department and aim of the naturalist's labours, and of the close resemblance of its language to the garb of thought characteristic of the mediæval scholastic mind.

The essential knowledge of which we are in quest rests on the determination of the form and structure of the newly acquired animal, the degree in which it resembles therein the previously known species, between any two of which it may thus be determined to stand, and the way in which it may have come to differ from them. In the zoological method of defining such results as may be attainable and have been attained, the differences are sought for, weighed, prominently set forth, and technically defined: in the homological quest the resemblances receive most attention; and the result of their appreciation is commonly, if not inevitably, some speculation, or tendency to speculate, on their cause and relations.

In the Gorilla, as in other latisternal Apes, the homologue of every organ and of almost every named part in Human anatomy is present.

To transmute a Gorilla into a Man the chief steps would be as follows:—In the alimentary canal, to develop the mucous membrane of the small intestines into the 'valvulæ conniventes,' and to alter the proportions as to length of the small and large intestines. To abrogate the sexual distinctions of the dental system: to reduce the size of the teeth, especially in relation to the head; to reduce in a greater degree the size of the incisors, and still more so that of the canines, especially in the males, so as to bring the crowns of all the teeth to the same level, admitting, and being followed by, their arrangement in a continuous unbroken series; to alter the shape of the canines and contiguous premolars, and to slightly modify that of the crowns of the other grinding teeth.

In the nervous system, the steps in transmutation would be to abrogate the law of the early arrest of the brain's growth, and to cause it to proceed, especially in the cerebral part, with the general growth and development of the frame, though in a slower ratio: to add to the number and depth of the cerebral convolutions, and to modify their disposition: to augment the size of the corpus callosum, both absolutely and relatively to the cerebellum and medulla oblongata: to expand the cerebrum in all directions, and especially backward beyond the cerebellum, so as to define a 'posterior' or 'post-cerebellar' lobe: to extend the chief cerebral cavity, or 'lateral ventricle,' forward beyond the corpus striatum into an 'anterior horn,' and backward beyond the hippocampus major into a 'posterior horn,' answerable to the cavity so called in anthropotomy, and with prominences corresponding with Tiedemann's and other anthropotomical definitions

of the 'hippocampus minor;' the beginnings, or incipient homologues, of which cavity and part are alone present in the highest Apes.

Coextensively with this new and improved condition of cerebral growth will be the expansion of the cranial cavity, as, with the reduction of the size of the teeth, there would be contraction of the jaws; the general result being the change in the proportions of the face to the cranium, and transmutation of the shape of the head and skull from that shown in vol. iv. pl. 28. to that shown in vol. iv. pl. 30. of the 'Transactions of the Zoological Society.'

In the vertebral column the following changes must take place:—Reduction of the length of the cervical spines and of the ribs of the thirteenth dorsal, converting this vertebra, by their anchylosis, into a first lumbar vertebra: liberation of the pleurapophyses of the twenty-third and twenty-fourth vertebræ at their distal ends, reduction of their thickness, and consequent transformation of the first two sacral into the last two lumbar vertebræ. The curves and disposition of the different sets or kinds of 'true vertebræ' must be likewise modified. When the zoologist contrasts *Homo* with *Troglodytes* or *Pithecus*, by predicating five lumbar vertebræ as peculiar to and characteristic of Man, in the limits of such comparison, the tyro is not to suppose that the modified homologues of those vertebræ are wanting in the Apes; nor will the teacher gain other than a passing notoriety by vaunting their presence as a new and valuable discovery, with brazen charges of their absolute denial by the real demonstrator of their homological existence.

Finally, in regard to the geographical distribution of the higher Quadrumana, I would contrast the peculiarly limited range of the Orangs and Chimpanzees with the cosmopolitan character of Mankind. The two species of Orang (*Pithecus*) are confined to Borneo and Sumatra; the two species of Chimpanzee (*Troglodytes*) are limited to an intertropical tract of the western part of Africa. They appear to be inexorably bound by climatal influences regulating the assemblage of certain trees and the production of certain fruits. With all our care, in regard to choice of food, clothing, and contrivances for artificially maintaining the chief physical conditions of their existence, the healthiest specimens of Orang or Chimpanzee, brought over in the vigour of youth, perish within a period never exceeding three years, and usually much shorter, in our climate. By what metamorphoses, we may ask, has the alleged humanized Chimpanzee or Orang been brought to endure all climates? The advocates of "transmutation" have failed to explain them. Certain it is that those physical differences in cerebral, dental, and osteological structure which place, in my estimate of them, the genus *Homo* in a distinct group of the mammalian class, zoologically of higher value than the 'order,' are associated with equally contrasted powers of endurance of different climates, whereby Man has become a denizen of every part of the globe, from the torrid to the arctic zones.

## DESCRIPTION OF THE PLATES.

## PLATE XLIII.

Adult male Gorilla (from Mr. du Chaillu's collection, purchased by the Trustees of the British Museum).

## PLATE XLIV.

Fig. 1. Adult male Gorilla, showing the ordinary quadrupedal mode of progression.

Fig. 2. Adult female Gorilla.

Fig. 3. Young male Gorilla.

(From Mr. du Chaillu's collection, purchased by the Trustees of the British Museum.)

The above figures were drawn by Mr. Joseph Wolf, for the illustration of the present Memoir, and lithographed, in 1861.

## PLATE XLV.

Fig. 1. From a photograph of a half-grown male Gorilla, as the specimen appeared, with much loss of cuticle and hair, when recently removed from the cask of spirits in which it had been transmitted from the Gaboon to the British Museum.

Fig. 2. From a photograph of the head of the same specimen.

Fig. 3. *Ibid.* Front view of the head.

Fig. 4. *Ibid.* Right side of the head.

## PLATE XLVI.

Fig. 1. From a sketch, by Mr. Joseph Wolf, of the same specimen, showing the nates and hind limbs.

Fig. 2. *Ibid.* Supine position.

Fig. 3. *Ibid.* Fore-arm and hand, as applied to the ground in progression.

Fig. 4. *Ibid.* Another view of the fore hand.

Fig. 5. *Ibid.* Fore hand grasping.

Fig. 6. *Ibid.* The hind hands.

## PLATE XLVII.

Fig. 1. From a photograph of a male Gorilla, retaining cuticle and hair, as the specimen appeared when recently removed from the cask of spirits in which it had been transmitted to the 'Derby Museum' at Liverpool.



- Fig. 2. *Ibid.* Palm of the fore hand.  
 Fig. 3. *Ibid.* Back of the fore hand.  
 Fig. 4. *Ibid.* Palm or sole of the hind hand.  
 Fig. 5. *Ibid.* Back of the hind hand.  
 Fig. 6. The pinna, auricle or external ear, of a young male Gorilla, photographed on a larger scale.  
*h.* Helix.  
*a.* Anthelix.  
*s.* Scaphoid fossa, or fossa of the helix.  
*f.* Fossa of the anthelix.  
*c.* Concha, partially divided by *h*, the commencement of the helix.  
*t.* Tragus.  
*r.* Antitragus.  
*i.* Incisura intertragica.  
*l.* Lobulus.

Fig. 7. The nose and part of the upper lip of the same animal, photographed on the same scale.

(For these photographs I am indebted to Mr. Moore, the able Curator of the Derby Museum.)

#### PLATE XLVIII.

- Fig. 1. Upper view of the cast of the cranial cavity, representing the brain of a full-grown male Gorilla.  
 Fig. 2. Side view of the same cast.  
*c.* Cerebrum.  
*b.* Cerebellum.  
 Fig. 3. Dissection of the brain of a young male Gorilla, showing the beginning of the posterior cornu and pes hippocampi minor.  
*a.* Corpus striatum.  
*b.* Tænia hippocampi.  
*c.* Hippocampus major.  
*e.* Posterior cornu with beginning of pes hippocampi minor.

(The diagram of this dissection, used in my Fullerian Course of Lectures at the Royal Institution, February 1861, was copied in the Report of the Lecture in the 'Athenæum,' March 23, 1861.)

#### PLATE XLIX.

Outlines of skull of a young Chimpanzee (sex unknown), and of a young male Gorilla, with deciduous dentition, answering to the human phase of the third year : three-fourths the natural size.

- Fig. 1. Upper view, *Troglodytes niger*.  
 Fig. 2. Side view, *Troglodytes niger*.  
 Fig. 3. Upper view, *Troglodytes Gorilla*.  
 Fig. 4. Side view, *Troglodytes Gorilla*.

The following symbols apply to each figure :—

- d.i.* 1. Deciduous mid-incisor, acquired in the human infant at about the seventh month.  
*d.i.* 2. Deciduous side-incisor, acquired in the human infant at about the eighth to the tenth month.  
*d.c.* Deciduous canine, acquired in the human infant at about the fourteenth to the twentieth month.  
*d.m.* 3. Deciduous anterior molar, answering to the 'third' of the typical diphyodont dentition, acquired in the human infant at from the twelfth to the fourteenth month.  
*d.m.* 4. Deciduous posterior molar, answering to the 'fourth' of the typical diphyodont dentition, acquired in the human child at from the eighteenth to the thirty-sixth month.  
*i.* 1 (in figs. 1 & 2). Germ of permanent mid-incisor.

In regard to the question of the relative degree of approximation to Man, or to the position in the animal series, of the Gorilla and Chimpanzee, the above outlines, engraved from drawings made with great care in 1860, show the greater absolute size of the cranium in the Gorilla; its greater relative size to the face, more especially the greater convexity of the frontal bone; the smaller relative size of the premaxillary (*d.i.* 1 & 2), containing the deciduous incisors; the smaller relative size of those incisors, both to the entire skull and to the molars.

The greater relative size of the deciduous canines in the Gorilla may depend upon a difference of sex; the skull of the young Chimpanzee may have been that of a female: it was presented to the Royal College of Surgeons of England, by Earl Spencer, in the year 1816, and is described in my 'Catalogue of the Osteology' of that museum, 4to, vol. ii. p. 781, no. 5171<sup>1</sup>.

<sup>1</sup> See also the memoir, "Sur le Gorille," in the 'Bulletin de la Société Linnéenne de Normandie' (vol. vi. Caen, 1861), by the accomplished Professor and Dean of the Faculty of Sciences of Caen, M. Eudes-Deslongchamps, in which are given figures of the skulls of the young Orang, Chimpanzee, and Gorilla, and of their deciduous dentition, confirmatory of the conclusions to which I had arrived as to their order of precedence in the zoological scale.



TROGLODYTES GORILLA mas adult



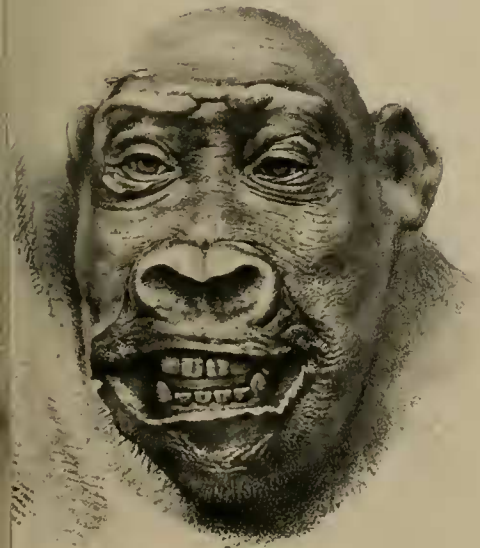
*Handwritten notes in the top left corner, possibly describing the specimen or the artist's process.*

J. Wolf del. e. sculp.

POGONOTES GORILLA fem et juv

Wm. Harhart Imp



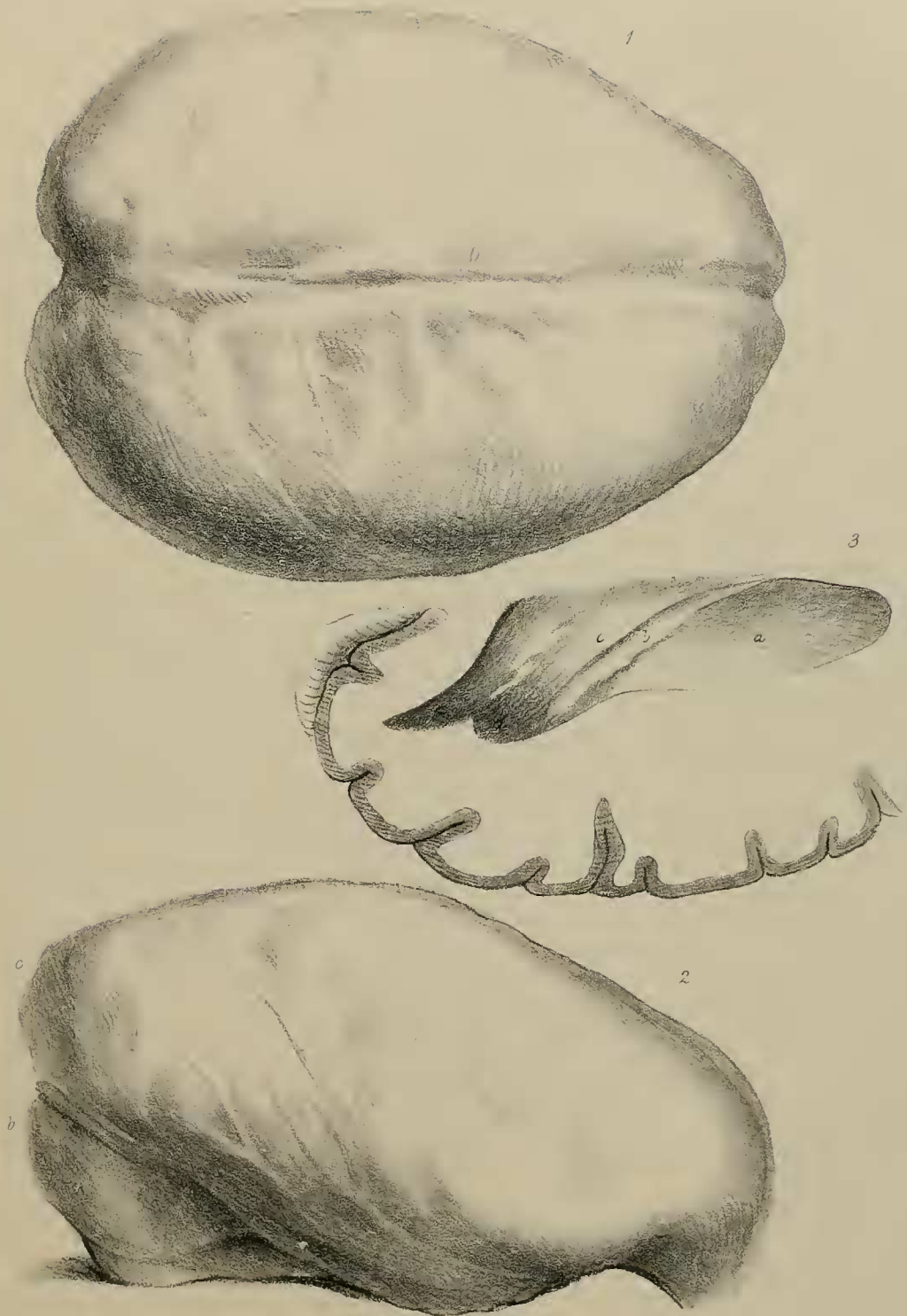


*Troglodytes Gorilla.*









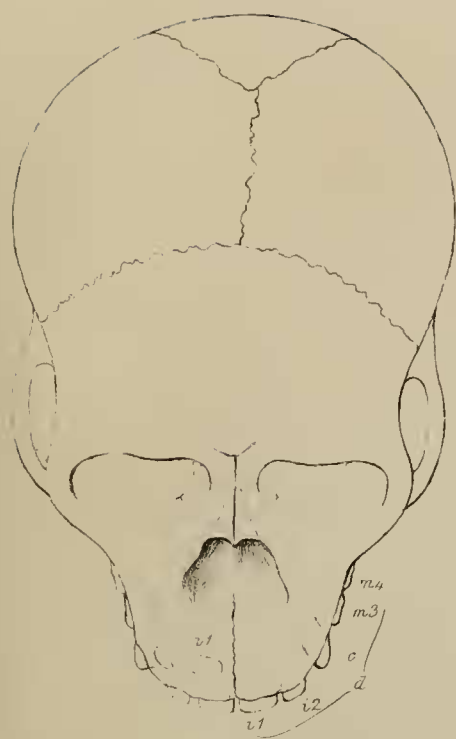
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*Troglodytes Gorilla*



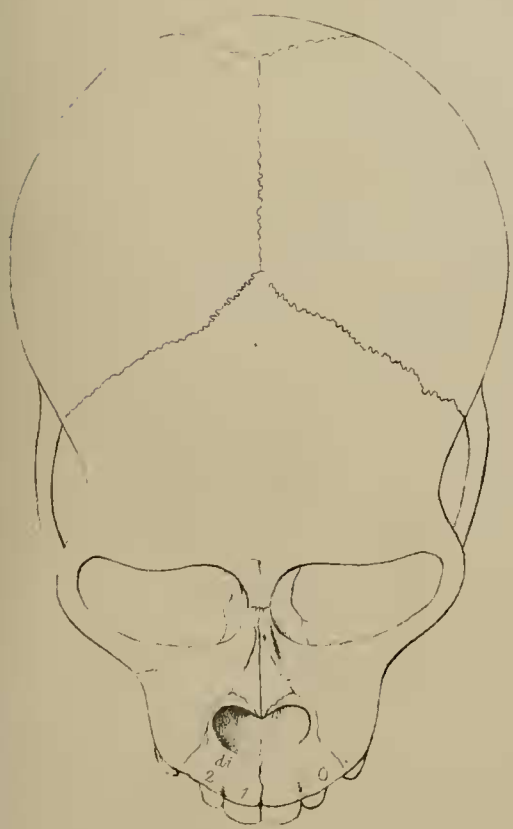
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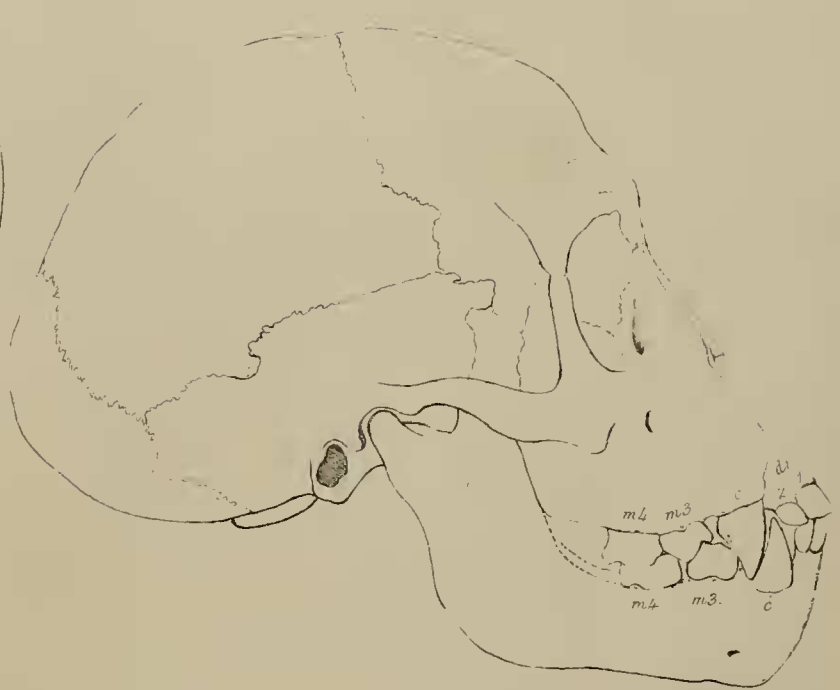
2



3



4



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